

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

OTTEVANGERS, S., U.
Vereenigde
Nieuwe Parklaan 97
NL-2587 BN The Hague
PAYS-BAS

Date of mailing (day/month/year) 15 June 2000 (15.06.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P48050PC00	
International application No. PCT/EP99/10209	International filing date (day/month/year) 16 December 1999 (16.12.99)

1. The following indications appeared on record concerning:

☒ the applicant ☒ the inventor ☐ the agent ☐ the common representative

Name and Address

State of Nationality

BE

State of Residence

BE

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person ☒ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address

NEZER, Carine, Danielle, Andrée
7, Impasse des Bruyères
4120 Neupre
Belgium

State of Nationality

BE

State of Residence

BE

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

Additional inventor and applicant for US.

4. A copy of this notification has been sent to:

☒ the receiving Office ☒ the designated Offices concerned
☒ the International Searching Authority ☐ the elected Offices concerned
☐ the International Preliminary Examining Authority ☐ other:
The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer

Philippe Bécamel

Facsimile No.: (41-22) 740.14.35

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION T R Y

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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
 United States Patent and Trademark
 Office
 Box PCT
 Washington, D.C.20231
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 15 August 2000 (15.08.00)	
International application No. PCT/EP99/10209	Applicant's or agent's file reference P48050PC00
International filing date (day/month/year) 16 December 1999 (16.12.99)	Priority date (day/month/year) 16 December 1998 (16.12.98)
Applicant ANDERSSON, Leif et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 13 July 2000 (13.07.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer F. Baechler Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P48050PC00	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 99/ 10209	International filing date (day/month/year) 16/12/1999	(Earliest) Priority Date (day/month/year) 16/12/1998
Applicant UNIVERSITY OF LIEGE et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☒ furnished subsequently to this Authority in written form.

☒ furnished subsequently to this Authority in computer readable form.

☒ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☒ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

☒ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/10209

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12Q1/68 C07K14/65 A01K67/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C12Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, MEDLINE, CHEM ABS Data, EMBASE, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ANDERSSON-EKLUND ET AL.: "MAPPING QUANTITATIVE LOCI FOR CARCASS AND MEAT QUALITY TRAITS IN A WILD BOAR x LARGE WHITE INTERCROSS" J. ANIM. SCI., vol. 76, 1998, pages 694-700, XP002104406 cited in the application	1-3, 10-12
Y	See page 696, "Carcass Composition" and page 698, Fig. 1b. the whole document --- -/--	4-9, 13-27

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

1 August 2000

Date of mailing of the international search report

08/08/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Hagenmaier, S

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/10209

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KOVACS AND KLÖTING: "MAPPING OF QUANTITATIVE TRAIT LOCI FOR BODY WEIGHT ON CHROMOSOMS 1 AND 4 IN THE RAT" BIOCHEMISTRY AND MOLECULAR BIOLOGY INTERNATIONAL, vol. 44, no. 2, February 1998 (1998-02), pages 399-405, XP002104407	1, 2, 10, 11
Y	the whole document	4-9, 13-27
Y	--- JOHANSSON ET AL.: "COMPARATIVE MAPPING REVEALS EXTENSIVE LINKAGE CONSERVATION-BUT WITH GENE ORDER REARRANGEMENTS-BETWEEN THE PIG AND THE HUMAN GENOMES" GENOMICS, vol. 25, 1995, pages 682-690, XP000610181 See Fig.1, pig chromosome 2 the whole document	4-9, 13-27
Y	--- REIK W ET AL: "IMPRINTING IN CLUSTERS: LESSONS FROM BECKWITH-WIEDEMANN SYNDROME" TRENDS IN GENETICS, vol. 13, no. 8, 1 August 1997 (1997-08-01), page 330-334 XP004084608 Igf2 the whole document	4-9, 13-27
Y	--- CATCHPOLE AND ENGSTRÖM: "NUCLEOTIDE SEQUENCE OF A PORCINE INSULINE-LIKE GROWTH FACTOR II cDNA" NUCLEIC ACIDS RESEARCH, vol. 18, no. 21, 1990, page 6430 XP002104409 cited in the application the whole document	15
A	--- ANDERSSON L ET AL: "GENETIC MAPPING OF QUANTITATIVE TRAIT LOCI FOR GROWTH AND FATNESS IN PIGS" SCIENCE, vol. 263, 25 March 1994 (1994-03-25), pages 1771-1774, XP002018359 cited in the application the whole document	
A	--- KNOTT ET AL.: "MULTIPLE MARKER MAPPING OF QUANTITATIVE TRAIT LOCI IN A CROSS BETWEEN OUTBRED WILD BOAR AND LARGE WHITE PIGS" GENETICS, vol. 149, June 1998 (1998-06), pages 1069-1080, XP002104410 cited in the application the whole document	
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INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/10209

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98 03682 A (UNIV IOWA RES FOUND) 29 January 1998 (1998-01-29) the whole document ----	
P,X	JEON ET AL.: "A PATERNALLY EXPRESSED QTL AFFECTING SKELETAL AND CARDIAC MUSCLE MASS IN PIGS MAPS TO THE IGF2 LOCUS" NAT.GENET., vol. 21, February 1999 (1999-02), pages 157-158, XP002104411 the whole document ----	1-27
P,X	NEZER ET AL.: "AN IMPRINTED QTL WITH MAJOR EFFECT ON MUSCLE MASS AND FAT DEPOSITION MAPS TO THE IGF2 LOCUS IN PIGS" NAT.GENET., vol. 21, February 1999 (1999-02), pages 155-156, XP002104412 the whole document -----	1-27

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 99/10209

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9803682 A	29-01-1998	US 5935784 A	10-08-1999
		AU 3513297 A	10-02-1998
		BR 9710875 A	11-01-2000
		CN 1230227 A	29-09-1999
		CZ 9900161 A	16-06-1999
		EP 0958376 A	24-11-1999
		PL 331353 A	05-07-1999
		US 5939264 A	17-08-1999

PATENT COOPERATION TREATY

WE

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

c/o VEREENIGDE
Nieuwe Parklaan 97
NL-2567 BN The Hague
PAYS-BAS

NRF₂ 16-6-2001

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

TERMIJN	30 MRT 2001
Beantwoord Voorl. def.	Bericht gezonden aan dd.
MAP	Applicant's or agent's file reference P48050PC00

Date of mailing
(day/month/year) 27.03.2001

IMPORTANT NOTIFICATION

International application No. PCT/EP99/10209	International filing date (day/month/year) 16/12/1999	Priority date (day/month/year) 16/12/1998
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Applicant
UNIVERSITY OF LIEGE et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

 European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

Danti, B

Tel. +49 89 2399-8161



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P48050PC00	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP99/10209	International filing date (<i>day/month/year</i>) 16/12/1999	Priority date (<i>day/month/year</i>) 16/12/1998
International Patent Classification (IPC) or national classification and IPC C12Q1/68		
Applicant UNIVERSITY OF LIEGE et al.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input checked="" type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input checked="" type="checkbox"/> Certain observations on the international application 		
Date of submission of the demand 13/07/2000	Date of completion of this report 27.03.2001	
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>	Authorized officer Hinchliffe, P Telephone No. +49 89 2399 8431	



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP99/10209

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

Description, pages:

1-56 as originally filed

Claims, No.:

1-27 as originally filed

Drawings, sheets:

1/48-48/48 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/10209

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 27.

because:

☒ the said international application, or the said claims Nos. 27 relate to the following subject matter which does not require an international preliminary examination (*specify*):
see separate sheet

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination report cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)

Yes: Claims 1-9,18-20

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP99/10209

	No:	Claims	10-17,21-26
Inventive step (IS)	Yes:	Claims	1-9,18-20
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-26
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

ITEM III

Claim 27 relates to subject-matter considered by this Authority to be covered by the provisions of Rule 67.1(ii) PCT. No examination of N., I.S. or I.A. will be carried out for this claim.

ITEM V

1. The priority document of the present application was available at the time that this report was written and was found to be valid. Consequently the documents cited as P'X' in the I.S.R. are not relevant to the question of novelty of the claims.
2. Claims 1-9,18-20 are novel and thus fulfill Art.33(2) PCT because D1 (as cited in the ISR) only discloses a method for producing a QTL of a domestic pig which can be used for selecting animals with the required trait. D1 notes that a marker was found at the proximal end of chromosome 2 (of pig) that was associated with the proportion of lean and bone (see section entitled "results") but no mention of a parentally imprinted QTL is made.
3. Claims 1-9,18-20 are also novel (Art.33(2) PCT) in the light of D2 (as cited in the ISR) which only discloses a method for producing a QTL of a rat which involves linking genetic markers to quantitative traits such as body mass (see summary). QTLs were found to be associated with chromosomes 1 and 4 and in particular IGF2 was suggested as being a possible candidate gene for the increased body mass shown by the rats. However the teachings of D2 do not mention parental imprinting of QTLs and thus this document is not prejudicial to the novelty of the said claims.
4. Claims 10-17,24 are not novel contrary to Art.33(2) PCT. The claims are directed towards nucleic acids sequences which may represent a parentally imprinted QTL. However D5 (as cited in the ISR) discloses

the nucleotide sequence of a porcine insulin like growth factor (IGF2).
As this sequence is a QTL it destroys the novelty of these claims.

5. Claims 21-23,25 refer to animals identified as carrying a QTL. However as the method used originally merely identifies an animal already in existence, claims directed to animals per se cannot be regarded as novel contrary to Art. 33(2) PCT. For the same reason claim 26 cannot be novel as the sperm or embryo claimed is derived from an already existing animal.

ITEM VII

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D2 is not mentioned in the description, nor is this document identified therein.

ITEM VIII

1. Contrary to the requirements of Art.6 PCT the reference to the two markers found in claim 7 is not clear. The figure does not provide sufficient sequence data for a skilled person to make/identify the said markers. Furthermore claim 7 contains a reference to the drawings. According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here.
2. Whereas the evidence provided in the examples refers exclusively to porcine systems, claims 1,2,4,5,8-11,14-21,24-27 cover *all animals*. Consequently the claims do not fulfill the requirement of Article 6 PCT insofar as they are not fully supported by the description.
3. The applicant's attention is drawn to the fact that because claims 21-27 could be considered to encompass human beings, in a possible regional phase before the EPO, these claims would be objected to under Article

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP99/10209

53(a) EPC.

PCTWORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : C12Q 1/68, C07K 14/65, A01K 67/02		A2	(11) International Publication Number: WO 00/36143
			(43) International Publication Date: 22 June 2000 (22.06.00)
(21) International Application Number: PCT/EP99/10209			(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
(22) International Filing Date: 16 December 1999 (16.12.99)			
(30) Priority Data: 98204291.3 16 December 1998 (16.12.98) EP			
(71) Applicants (for all designated States except US): UNIVERSITY OF LIEGE [BE/BE]; 20 Bd de Colonster, B-4000 Liege (BE). MELICA HB [SE/SE]; Andersson, Leif, Bergagatan 30, S-752 39 Uppsala (SE). SEGHERSGENTEC N.V. [BE/BE]; Kapelbaan 15, B-9255 Buggenhout (BE).			
(72) Inventors; and (75) Inventors/Applicants (for US only): ANDERSSON, Leif [SE/SE]; Bergagatan 30, S-752 39 Uppsala (SE). GEORGES, Michel [BE/BE]; Rue Vieux Tige 24, B-3161 Villers-aux-Tours (BE). SPINCEMAILLE, Geert [BE/BE]; Sint Denijsstraat 26, B-8550 Zwevegem (BE).			
(74) Agent: OTTEVANGERS, S., U.; Vereenigde, Nieuwe Parklaan 97, NL-2587 BN The Hague (NL).			Published Without international search report and to be republished upon receipt of that report.
(54) Title: SELECTING ANIMALS FOR PARENTALLY IMPRINTED TRAITS			
(57) Abstract <p>The invention relates to methods to select breeding animals or animals destined for slaughter for having desired genotypic or potential phenotypic properties, in particular related to muscle mass and/or fat deposition. The invention provides a method for selecting a pig for having desired genotypic or potential phenotypic properties comprising testing a sample from said pig for the presence of a quantitative trait locus (QTL) located at a Sus scrofa chromosome 2 mapping at position 2p1.7.</p>			

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
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CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
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CM	Cameroon			PL	Poland		
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CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

Title: Selecting animals for parentally imprinted traits.

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The invention relates to methods to select breeding animals or animals destined for slaughter for having desired genotypic or potential phenotypic properties, in particular related to muscle mass and/or fat deposition. Breeding schemes for domestic animals have so far focused on farm performance traits and carcass quality. This has resulted in substantial improvements in traits like reproductive success, milk production, lean/fat ratio, prolificacy, growth rate and feed efficiency. Relatively simple performance test data have been the basis for these improvements, and selected traits were assumed to be influenced by a large number of genes, each of small effect (the infinitesimal gene model). There are now some important changes occurring in this area. First, the breeding goal of some breeding organisations has begun to include meat quality attributes in addition to the "traditional" production traits. Secondly, evidence is accumulating that current and new breeding goal traits may involve relatively large effects (known as major genes), as opposed to the infinitesimal model that has been relied on so far.

Modern DNA-technologies provide the opportunity to exploit these major genes, and this approach is a very promising route for the improvement of meat quality, especially since direct meat quality assessment is not viable for potential breeding animals. Also for other traits such as lean/fat ratio, growth rate and feed efficiency, modern DNA technology can be very effective. Also these traits are not always easy to measure in the living animal.

The evidence for several of the major genes originally obtained using segregation analysis, i.e. without any DNA marker information. Afterwards molecular studies were performed to detect the location of these

genes on the genetic map. In practice, and except for alleles of very large effect, DNA studies are required to dissect the genetic nature of most traits of economic importance. DNA markers can be used to localise genes or alleles responsible for qualitative traits like coat colour, and they can also be used to detect genes or alleles with substantial effects on quantitative traits like growth rate, IMF etc. In this case the approach is referred to as QTL (quantitative trait locus) mapping, wherein a QTL comprises at least a part of the nucleic acid genome of an animal where genetic information capable of influencing said quantitative trait (in said animal or in its offspring) is located. Information at DNA level can not only help to fix a specific major gene in a population, but also assist in the selection of a quantitative trait which is already selected for. Molecular information in addition to phenotypic data can increase the accuracy of selection and therefore the selection response.

Improving meat quality or carcass quality is not just about changing levels of traits like tenderness or marbling, but it is also about increasing uniformity. The existence of major genes provides excellent opportunities for improving meat quality because it allows large steps to be made in the desired direction. Secondly, it will help to reduce variation, since we can fix relevant genes in our products. Another aspect is that selecting for major genes allows differentiation for specific markets. Studies are underway in several species, particularly, pigs, sheep, deer and beef cattle.

In particular, intense selection for meat production has resulted in several livestock species. In recent years it has become feasible to map and clone several of the genes causing these phenotypes, paving the way towards more efficient marker assisted selection, targeted drug development (performance enhancing products) and transgenesis. Mutations in the ryanodine receptor (Fuji

et al, 1991; MacLennan and Phillips, 1993) and myostatin (Grobet et al, 1997; Kambadur et al, 1997; McPherron and Lee, 1997) have been shown to cause muscular hypertrophies in pigs and cattle respectively, while
5 genes with major effects on muscularity and/or fat deposition have for instance been mapped to pig chromosome 4 (Andersson et al, 1994) and sheep chromosome 18 (Cocket et al, 1996).

However, although there have been successes in
10 identifying QTLs, the information is currently of limited use within commercial breeding programmes. Many workers in this field conclude that it is necessary to identify the particular genes underlying the QTL. This is a substantial task, as the QTL region is usually relatively
15 large and may contain many genes. Identification of the relevant genes from the many that may be involved thus remains a significant hurdle in farm animals.

The invention provides a method for selecting a
20 domestic animal for having desired genotypic or potential phenotypic properties comprising testing said animal for the presence of a parentally imprinted qualitative or quantitative trait locus (QTL). Herein, a domestic animal is defined as an animal being selected or having been
25 derived from an animal having been selected for having desired genotypic or potential phenotypic properties.

Domestic animals provide a rich resource of genetic and phenotypic variation, traditionally domestication involves selecting an animal or its offspring for having
30 desired genotypic or potential phenotypic properties. This selection process has in the past century been facilitated by growing understanding and utilisation of the laws of Mendelian inheritance. One of the major problems in breeding programs of domestic animals is the
35 negative genetic correlation between reproductive capacity and production traits. This is for example the case in cattle (a high milk production generally results

in slim cows and bulls) poultry, broiler lines have a low level of egg production and layers have generally very low muscle growth), pigs (very prolific sows are in general fat and have comparatively less meat) or sheep

5 (high prolific breeds have low carcass quality and vice versa). The invention now provides that knowledge of the parental imprinting character of various traits allows to select for example sire lines homozygous for a paternally imprinted QTL for example linked with muscle production

10 or growth; the selection for such traits can thus be less stringent in dam lines in favour of the reproductive quality. The phenomenon of genetic or parental imprinting has never been utilised in selecting domestic animals, it was never considered feasible to employ this elusive

15 genetic characteristic in practical breeding programmes. The invention provides a breeding programme, wherein knowledge of the parental imprinting character of a desired trait, as demonstrated herein, results in a breeding programme, for example in a BLUP programme, with

20 a modified animal model. This increases the accuracy of the breeding value estimation and speeds up selection compared to conventional breeding programmes. Until now, the effect of a parentally imprinted trait in the estimation of a conventional BLUP programme was

25 neglected; using and understanding the parental character of the desired trait, as provided by the invention, allows selecting on parental imprinting, even without DNA testing. For example, selecting genes characterised by paternal imprinting is provided to help increase

30 uniformity; a (terminal) parent homozygous for the "good or wanted" alleles will pass them to all offspring, regardless of the other parent's alleles, and the offspring will all express the desired parent's alleles. This results in more uniform offspring. Alleles that are

35 interesting or favourable from the maternal side or often the ones that have opposite effects to alleles from the paternal side. For example, in meat animals such as pigs alleles linked with meat quality traits such as intra-

muscular fat or muscle mass could be fixed in the dam lines while alleles linked with reduced back fat could be fixed in the sire lines. Other desirable combinations are for example fertility and/or milk yield in the female line with growth rates and/or muscle mass in the male lines.

In a preferred embodiment, the invention provides a method for selecting a domestic animal for having desired genotypic or potential phenotypic properties comprising testing a nucleic acid sample from said animal for the presence of a parentally imprinted quantitative trait locus (QTL). A nucleic acid sample can in general be obtained from various parts of the animal's body by methods known in the art. Traditional samples for the purpose of nucleic acid testing are blood samples or skin or mucosal surface samples, but samples from other tissues can be used as well, in particular sperm samples, oocyte or embryo samples can be used. In such a sample, the presence and/or sequence of a specific nucleic acid, be it DNA or RNA, can be determined with methods known in the art, such as hybridisation or nucleic acid amplification or sequencing techniques known in the art. The invention provides testing such a sample for the presence of nucleic acid wherein a QTL or allele associated therewith is associated with the phenomenon of parental imprinting, for example where it is determined whether a paternal or maternal allele of said QTL is capable of being predominantly expressed in said animal.

The purpose of breeding programs in livestock is to enhance the performances of animals by improving their genetic composition. In essence this improvement accrues by increasing the frequency of the most favourable alleles for the genes influencing the performance characteristics of interest. These genes are referred to as QTL. Until the beginning of the nineties, genetic improvement was achieved via the use of biometrical methods, but without molecular knowledge of the underlying QTL.

Since the beginning of the nineties and due to recent developments in genomics, it is conceivable to identify the QTL underlying a trait of interest. The invention now provides identifying and using parentally
5 imprinted QTLs which are useful for selecting animals by mapping quantitative trait loci. Again, the phenomenon of genetic or paternal imprinting has never been utilised in selecting domestic animals, it was never considered
10 feasible to employ this elusive genetic characteristic in practical breeding programmes. For example Kovacs and Kloting (Biochem. Mol. Biol. Int. 44:399-405, 1998), where parental imprinting is not mentioned, and not suggested, found linkage of a trait in female rats, but not in males, suggesting a possible sex specificity
15 associated with a chromosomal region, which of course excludes parental imprinting, a phenomenon wherein the imprinted trait of one parent is preferably but gender-aspecifically expressed in his or her offspring.

The invention provides the initial localisation of a
20 parentally imprinted QTL on the genome by linkage analysis with genetic markers, and the actual identification of the parentally imprinted gene(s) and causal mutations therein. Molecular knowledge of such a parentally imprinted QTL allows for more efficient
25 breeding designs herewith provided. Applications of molecular knowledge of parentally imprinted QTLs in breeding programs include: marker assisted segregation analysis to identify the segregation of functionally distinct parentally imprinted QTL alleles in the
30 populations of interest, marker assisted selection (MAS) performed within lines to enhance genetic response by increasing selection accuracy, selection intensity or by reducing the generation interval using the understanding of the phenomonon of parental imprinting, marker assisted
35 introgression (MAI) to efficiently transfer favourable parentally imprinted QTL alleles from a donor to a recipient population, genetic engineering of the identified parentally QTL and genetic modification of the breeding stock using transgenic technology, development

of performance enhancing products using targeted drug development exploiting molecular knowledge of said QTL.

The inventors undertook two independent experiments to determine the practical use of parental imprinting of a QTL.

In a first experiment, performed in a previously described Piétrain x Large White intercross, the likelihood of the data were computed under a model of paternal (paternal allele only expressed) and maternal imprinting (maternal allele only expressed) and compared with the likelihood of the data under a model of a conventional "Mendelian" QTL. The results strikingly demonstrated that the QTL was indeed paternally expressed, the QTL allele (Piétrain or Large White) inherited from the F₁ sow having no effect whatsoever on the carcass quality and quantity of the F₂ offspring. It was seen that very significant lodscores were obtained when testing for the presence of a paternally expressed QTL, while there was no evidence at all for the segregation of a QTL when studying the chromosomes transmitted by the sows. The same tendency was observed for all traits showing that the same imprinted gene is responsible for the effects observed on the different traits. Table 1 reports the maximum likelihood (ML) phenotypic means for the F₂ offspring sorted by inherited paternal QTL allele.

In a second experiment performed in the Wild Boar X Large White intercross, QTL analyses of body composition, fatness, meat quality, and growth traits was carried out with the chromosome 2 map using a statistical model testing for the presence of an imprinting effect. Clear evidence for a paternally expressed QTL located at the very distal tip of 2p was obtained (Fig. 2; Table1). The clear paternal expression of a QTL is illustrated by the least squares means which fall into two classes following the population origin of the paternally inherited allele (Table 1). For a given paternally imprinted QTL, implementation of marker assisted segregation analysis, selection (MAS) and introgression (MAI), can be performed

using genetic markers that are linked to the QTL, genetic markers that are in linkage disequilibrium with the QTL, or using the actual causal mutations within the QTL.

Understanding the parent-of-origin effect

5 characterising a QTL allows for its optimal use in breeding programs. Indeed, marker assisted segregation analysis under a model of parental imprinting will yield better estimates of QTL allele effects. Moreover it allows for the application of specific breeding schemes
10 to optimally exploit a QTL. In one embodiment of the invention, the most favourable QTL alleles would be fixed in breeding animal lines and for example used to generate commercial, crossbred males by marker assisted selection (MAS, within lines) and marker assisted introgression
15 (MAI, between lines). In another embodiment, the worst QTL alleles would be fixed in the animal lines used to generate commercial crossbred females by MAS (within lines) and MAI (between lines).

In a preferred embodiment of the invention, said
20 animal is a pig. Note for example that the invention provides the insight that today half of the offspring from commercially popular Piétrain_x Large White crossbred boars inherit an unfavourable Large White muscle mass QTL as provided by the invention causing considerable loss,
25 and the invention now for example provides the possibility to select the better half of the population in that respect. However, it is also possible to select commercial sow lines enriched with the in the boars unfavourable alleles, allowing to equip the sows with
30 other alleles more desirable for for example reproductive purposes.

In a preferred embodiment of a method provided by the invention, said QTL is located at a position corresponding to a QTL located at chromosome 2 in the
35 pig. For example, it is known from comparative mapping data between pig and human, including bidirectional chromosome painting, that SSC2p is homologous to HSA11pter-q13^{11,12}. HSA11pter-q13 is known to harbour a

cluster of imprinted genes: IGF2, INS2, H19, MAH2, P57^{KIP2}, K_vLQTL1, Tapal,/CD81, Orctl2, Impt1 and Ipl. The cluster of imprinted genes located in HSA11pter-q13 is characterised by 8 maternally expressed genes H19, MASH2, P57^{KIP2}, K_vLQTL1, TAPA1/CD81, ORCTL2, IMPT1 and IPL1, and two paternally expressed genes: IGF2 and INS. However, Johanson et al (Genomics 25:682-690, 1995) and Reik et al (Trends in Genetics, 13:330-334, 1997) show that the whereabouts of these loci in various animals are not clear. For example, the HSA11 and MMU7 loci do not correspond among each other, the MMU7 and the SSC2 loci do not correspond, whereas the HSA11 and SSC2 loci seem to correspond, and no guidance is given where one or more of for example the above identified parentally expressed individual genes are localised on the three species' chromosomes.

Other domestic animals, such as cattle, sheep, poultry and fish, having similar regions in their genome harbouring such a cluster of imprinted genes or QTLs, the invention herewith provides use of these orthologous regions of other domestic animals in applying the phenomenon of parental imprinting in breeding programmes. In pigs, said cluster is mapped at around position 2p1.7 of chromosome 2, however, a method as provided by the invention employing (fragments of) said maternally or paternally expressed orthologous or homologous genes or QTLs are advantageously used in other animals as well for breeding and selecting purposes. For example, a method is provided wherein said QTL is related to the potential muscle mass and/or fat deposition, preferably with limited effects on other traits such as meat quality and daily gain of said animal or wherein said QTL comprises at least a part of an insulin-like growth factor-2 (IGF2) allele. Reik et al (Trends in Genetics, 13:330-334, 1997) explain that this gene in humans is related to Beckwith-Wiedemann syndrome, an apparently parentally imprinted disease syndrome most commonly seen with human fetuses, where the gene has an important role in prenatal

development. No relationship is shown or suggested with postnatal development relating to muscle development or fatness in (domestic) animals.

In a preferred embodiment, the invention provides a method for selecting a pig for having desired genotypic or potential phenotypic properties comprising testing a sample from said pig for the presence of a quantitative trait locus (QTL) located at a *Sus scrofa* chromosome 2 mapping at position 2p1.7. In particular, the invention relates to the use of genetic markers for the telomeric end of pig chromosome 2p in marker selection (MAS) of a parentally imprinted Quantitative Trait Locus (QTL) affecting carcass yield and quality in pigs. Furthermore, the invention relates to the use of genetic markers associated with the IGF2 locus in MAS in pigs, such as polymorphisms and microsatellites and other characterising nucleic acid sequences shown herein, such as shown in figures 4 to 10. In a preferred embodiment, the invention provides a QTL located at the distal tip of *Sus scrofa* chromosomes 2 with effects on various measurements of carcass quality and quantity, particularly muscle mass and fat deposition.

In a first experiment, a QTL mapping analysis was performed in a Wild Boar X Large White intercross counting 200 F₂ individuals. The F₂ animals were sacrificed at a live weight of at least 80 kg or at a maximum age of 190 days. Phenotypic data on birth weight, growth, fat deposition, body composition, weight of internal organs, and meat quality were collected; a detailed description of the phenotypic traits are provided by Andersson et al¹ and Andersson-Eklund et al⁴.

A QTL (without any significant effect on back-fat thickness) at an unspecified locus on the proximal end of chromosome 2 with moderate effect on muscle mass, and located about 30cM away from the parentally imprinted QTL reported here, was previously reported by the inventors; whereas the QTL as now provided has a very large effect, explaining at least 20-30% of variance, making the QTL of

the present invention commercially very attractive, which is even more so because the present QTL is parentally imprinted. The marker map of chromosome 2p was improved as part of this invention by adding microsatellite markers in order to cover the entire chromosome arm. The following microsatellite markers were used: *Swc9*, *Sw2443*, *Sw2623*, and *Swr2516*, all from the distal end of 2p⁷. QTL analyses of body composition, fatness, meat quality, and growth traits were carried out with the new chromosome 2 map. Clear evidence for a QTL located at the very distal tip of 2p was obtained (Fig. 1; Table 1). The QTL had very large effects on lean meat content in ham and explained an astonishing 30% of the residual phenotypic variance in the F₂ population. Large effects on the area of the longissimus dorsi muscle, on the weight of the heart, and on back-fat thickness (subcutaneous fat) were also noted. A moderate effect on one meat quality trait, reflectance value, was indicated. The QTL had no significant effect on abdominal fat, birth weight, growth, weight of liver, kidney, or spleen (data not shown). The Large White allele at this QTL was associated with larger muscle mass and reduced back-fat thickness consistent with the difference between this breed and the Wild Boar population.

In a second experiment, QTL mapping was performed in a Piétrain X Large White intercross comprising 1125 F₂ offspring. The Large White and Piétrain parental breeds differ for a number of economically important phenotypes. Piétrains are famous for their exceptional muscularity and leanness ¹⁰(Figure 2, while Large Whites show superior growth performance. Twenty-one distinct phenotypes measuring growth performance (5), muscularity (6), fat deposition (6), and meat quality (4), were recorded on all F₂ offspring. In order to map QTL underlying the genetic differences between these breeds, the inventors undertook a whole genome scan using microsatellite markers on an initial sample of 677 F₂ individuals. The following microsatellite marker map was used to analyse

chromosome 2;:SW2443, SWC9 and SW2623, SWR2516-(0,20)-
SWR783-(0,29)-SW240-(0,20)-SW776-(0,08)-S0010-(0,04)-
SW1695-(0,36)-SWR308. Analysis of pig chromosome 2 using
a Maximum Likelihood multipoint algorithm, revealed
5 highly significant lodscores (up to 20) for three of the
six phenotypes measuring muscularity (% lean cuts, % ham,
% loin) and three of the six phenotypes measuring fat
deposition (back-fat thickness (BFT), % backfat, % fat
cuts) at the distal end of the short arm of chromosome 2
10 (Figure 1). Positive lodscores were obtained in the
corresponding chromosome region for the remaining six
muscularity and fatness phenotypes, however, not reaching
the experiment-wise significance threshold ($\alpha=5\%$). There
was no evidence for an effect of the corresponding QTL on
15 growth performance (including birth weight) or recorded
meat quality measurements (data not shown). To confirm
this finding, the remaining sample of 355 F₂ offspring was
genotyped for the four most distal 2p markers and QTL
analysis performed for the traits yielding the highest
20 lodscores in the first analysis. Lodscores ranged from
2.1 to 7.7, clearly confirming the presence of a major
QTL in this region. Table 2 reports the corresponding ML
estimates for the three genotypic means as well as the
residual variance. Evidence based on marker assisted
25 segregation analysis points towards residual segregation
at this locus within the Piétrain population.

These experiments therefore clearly indicated
the existence of a QTL with major effect on carcass
quality and quantity on the telomeric end of pig
30 chromosome arm 2p; the likely existence of an allelic
series at this QTL with at least three alleles: Wild-Boar
< Large White < Piétrain, and possibly more given the
observed segregation within the Piétrain breed.

The effects of the identified QTL on muscle mass and
35 fat deposition are truly major, being of the same
magnitude of those reported for the CRC locus though
apparently without the associated deleterious effects on
meat quality. We estimate that both loci jointly explain

close to 50% of the Piétrain versus Large White breed difference for muscularity and leanness. The QTL had very large effects on lean meat content in ham and explained an astonishing 30% of the residual phenotypic variance in the F₂ population. Large effects on the area of the longissimus dorsi muscle, on the weight of the heart, and on back-fat thickness (subcutaneous fat) were also noted. A moderate effect on one meat quality trait, reflectance value, was indicated. The QTL had no significant effect on abdominal fat, birth weight, growth, weight of liver, kidney, or spleen (data not shown). The Large White allele at this QTL, when compared to the Wild Boar allele, was associated with larger muscle mass and reduced back-fat thickness consistent with the difference between this breed and the Wild Boar population. The strong imprinting effect observed for all affected traits shows that a single causative locus is involved. The pleiotropic effects on skeletal muscle mass and the size of the heart appear adaptive from a physiological point of view as a larger muscle mass requires a larger cardiac output.

In a further embodiment, the invention provides a method for selecting a pig for having desired genotypic or potential phenotypic properties comprising testing a sample from said pig for the presence of a quantitative trait locus (QTL) located at a *Sus scrofa* chromosome 2 mapping at position 2p1.7., wherein said QTL comprises at least a part of a *Sus scrofa* insulin-like growth factor-2 (IGF2) allele or a genomic area closely related thereto, such as polymorphisms and microsatellites and other characterising nucleic acid sequences shown herein, such as shown in figures 4 to 10. The important role of *IGF2* for prenatal development is well-documented from knock-out mice as well as from its causative role in the human Beckwith-Wiedemann syndrome. This invention demonstrates an important role for the *IGF2*-region also for postnatal development.

To show the role of *Igf2* the inventors performed the following three experiments:

A genomic *IGF2* clone was isolated by screening a porcine BAC library. FISH analysis with this BAC clone
5 gave a strong consistent signal on the terminal part of chromosome 2p.

A polymorphic microsatellite is located in the 3'UTR of *IGF2* in mice (GenBank U71085), humans (GenBank S62623), and horse (GenBank AF020598). The possible
10 presence of a corresponding porcine microsatellite was investigated by direct sequencing of the *IFG2* 3'UTR using the BAC clone. A complex microsatellite was identified about 800bp downstream of the stop codon; a sequence comparison revealed that this microsatellite was
15 identical to a previously described anonymous microsatellite, *Swc9*⁶. This marker was used in the initial QTL mapping experiments and its location on the genetic map correspond with the most likely position of the QTL both in the Piétrain X Large White and in the Large White
20 x Wild Boar pedigree.

Analysis of skeletal muscle and liver cDNA from 10-week old fetuses heterozygous for a nt241 (G-A) transversion in the second exon of the porcine *IGFII* gene and *SWC9*, shows that the *IGFII* gene is imprinted in these
25 tissues in the pig as well and only expressed from the paternal allele.

Based on a published porcine adult liver cDNA sequence¹⁶, the inventors designed primer pairs allowing to amplify the entire *IgfII* coding sequence with 222 bp
30 of leader and 280 bp of trailer sequence from adult skeletal muscle cDNA. Piétrain and Large White RT-PCR products were sequenced indication that the coding sequences are identical in both breeds and with the published sequence. However, a G→A transition was found
35 in the leader sequence corresponding to exon 2 in man. Following conventional nomenclature, this polymorphism will be referred to as nt241(G-A). We developed a screening test for this single nucleotide polymorphism

9(SNP) based on the ligation amplification reaction (LAR), allowing us to genotype our pedigree material. Based on these data, *IgfII* was shown to colocalize with the SWC9 microsatellite marker ($\theta=0\%$), therefore
5 virtually coinciding with the most likely position of the QTL, and well within the 95% support interval for the QTL. Subsequent sequence analysis demonstrated that the microsatellite marker SWC9 is actually located within the 3'UTR of the *IgfII* gene.

10 As previously mentioned, the knowledge of this QTL provides a method for the selection of animals such as pigs with improved carcass merit. Different embodiments of the invention are envisaged, including:
15 segregation of functionally distinct QTL alleles in the populations of interest; marker assisted selection (MAS) performed within lines to enhance genetic response by increasing selection accuracy, selection intensity or by reducing the generation interval; marker assisted
20 introgression (MAI) to efficiently transfer favourable QTL alleles from a donor to a recipient population, thereby enhancing genetic response in the recipient population. Implementation of embodiments marker assisted segregation analysis, selection (MAS) and introgression
25 (MAI), can be performed using genetic markers that are linked to the QTL; genetic markers that are in linkage disequilibrium with the QTL, the actual causal mutations within the QTL.

In a further embodiment, the invention provides a
30 method for selecting a pig for having desired genotypic or potential phenotypic properties comprising testing a sample from said pig for the presence of a quantitative trait locus (QTL) located at a *Sus scrofa* chromosome 2 mapping at position 2p1.7., wherein said QTL is
35 paternally expressed, i.e. is expressed from the paternal allele. In man and mouse, *Igf2* is known to be imprinted and to be expressed exclusively from the paternal allele in several tissues. Analysis of skeletal muscle cDNA from

pigs heterozygous for the SNP and/or SWC9, shows that the same imprinting holds in the pig as well. Understanding the parent-of-origin effect characterising the QTL as provided by the invention now allows for its optimal use in breeding programs. Indeed, today half of the offspring from commercially popular Piétrain x Large White crossbred boars inherit the unfavourable Large White allele causing considerable loss. Using a method as provide by the invention avoids this problem.

10 The invention furthermore provides an isolated and/or recombinant nucleic acid or functional fragment derived thereof comprising a parentally imprinted quantitative trait locus (QTL) or fragment thereof capable of being predominantly expressed by one parental
15 allele. Having such a nucleic acid as provided by the invention available allows constructing transgenic animals wherein favourable genes are capable of being exclusively or predominantly expressed by one parental allele, thereby equipping the offspring of said animal
20 homozygous for a desired trait with desired properties related to that parental allele that is expressed.

 In a preferred embodiment, the invention provides an isolated and/or recombinant nucleic acid or fragment derived thereof comprising a synthetic parentally
25 imprinted quantitative trait locus (QTL) or functional fragment thereof derived from at least one chromosome. Synthetic herein describes a parentally expressed QTL wherein various elements are combined that originate from distinct locations from the genome of one or more
30 animals. The invention provides recombinant nucleic acid wherein sequences related to parental imprinting of one QTL are combined with sequences relating to genes or favourable alleles of a second QTL. Such a gene construct is favourably used to obtain transgenic animals wherein
35 the second QTL has been equipped with paternal imprinting, as opposed to the inheritance pattern in the native animal from which the second QTL is derived. Such a second QTL can for example be derived from the same

chromosome where the parental imprinting region is located, but can also be derived from a different chromosome from the same or even a different species. In the pig, such a second QTL can for example be related to an oestrogen receptor (ESR)-gene (Rothschild et al, PNAS, 93, 201-201, 1996) or a FAT-QTL (Andersson, Science, 263, 1771-1774, 1994) for example derived from an other pig chromosome, such as chromosome 4. A second or further QTL can also be derived from another (domestic) animal or a human.

The invention furthermore provides an isolated and/or recombinant nucleic acid or functional fragment derived thereof at least partly corresponding to a QTL of a pig located at a *Sus scrofa* chromosome 2 mapping at position 2p1.7 wherein said QTL is related to the potential muscle mass and/or fat deposition of said pig and/or wherein said QTL comprises at least a part of a *Sus scrofa* insulin-like growth factor-2 (IGF2) allele, preferably at least spanning a region between INS and H19, or preferably derived from a domestic pig, such as a Pietrain, Meishan, Duroc, Landrace or Large White, or from a Wild Boar. For example, a genomic IGF2 clone was isolated by screening a porcine BAC library. FISH analysis with this BAC clone gave a strong consistent signal on the terminal part of chromosome 2p. A polymorphic microsatellite is located in the 3'UTR of IGF2 in mice (GenBank U71085), humans (GenBank S62623), and horse (GenBank AF020598). The possible presence of a corresponding porcine microsatellite was investigated by direct sequencing of the IGF2 3'UTR using the BAC clone. A complex microsatellite was identified about 800 bp downstream of the stop codon; a sequence comparison revealed that this microsatellite is identical to a previously described anonymous microsatellite, Swc9. PCR primers were designed and the microsatellite (IGF2_{ms}) was found to be highly polymorphic with three different alleles among the two Wild Boar founders and another two

among the eight Large White founders. *IGF2ms* was fully informative in the intercross as the breed of origin as well as the parent of origin could be determined with confidence for each allele in each F_2 animal.

5 A linkage analysis using the intercross pedigree was carried out with *IGF2ms* and the microsatellites *Sw2443*, *Sw2623*, and *Swr2516*, all from the distal end of 2p⁷. *IGF2* was firmly assigned to 2p by highly significant lod scores (e.g. $Z=89.0$, $\theta=0.003$ against *Swr2516*). Multipoint
10 analyses, including previously typed chromosome 2 markers, revealed the following order of loci (sex-average map distances in Kosambi cM): *Sw2443/Swr2516*-0.3-*IGF2*-14.9-*Sw2623*-10.3-*Sw256*. No recombinant was observed between *Sw2443* and *Swr2516*, and the suggested proximal
15 location of *IGF2* in relation to these loci is based on a single recombinant giving a lod score support of 0.8 for the reported order. The most distal marker in our previous QTL study, *Sw256*, is located about 25 cM from the distal end of the linkage group.

20 The invention furthermore provides use of a nucleic acid or functional fragment derived thereof according to the invention in a method according to the invention. In a preferred embodiment, use of a method according to invention is provided to select a breeding animal or
25 animal destined for slaughter, or embryos or semen derived from these animals for having desired genotypic or potential phenotypic properties. In particular, the invention provides such use wherein said properties are related to muscle mass and/or fat deposition. The QTL as
30 provided by the invention may be exploited or used to improve for example lean meat content or back-fat thickness by marker assisted selection within populations or by marker assisted introgression of favorable alleles from one population to another. Examples of marker
35 assisted selection using the QTL as provided by the invention are use of marker assisted segregation analysis

with linked markers or with markers in disequilibrium to identify functionally distinct QTL alleles. Furthermore, identification of a causative mutation in the QTL is now possible, again leading to identify functionally distinct QTL alleles. Such functionally distinct QTL alleles located at the distal tip of chromosome 2p with large effects on skeletal muscle mass, the size of the heart, and on back-fat thickness are also provided by the invention. The observation of a similar QTL effect in a Large White x Wild Boar as well as in a Piétrain x Large White intercross provides proof of the existence of a series of at least three distinct functional alleles. Moreover, preliminary evidence based on marker assisted segregation analysis points towards residual segregation at this locus within the Piétrain population (data not shown). The occurrence of an allelic series as provided by the invention allows identifying causal polymorphisms which - based on the quantitative nature of the observed effect - are unlikely to be gross gene alterations but rather subtle regulatory mutations. The effects on muscle mass of the three alleles rank in the same order as the breeds in which they are found i.e. Piétrain pigs are more muscular than Large White pigs that in turn have higher lean meat content than Wild Boars. The invention furthermore provides use of the alleles as provided by the invention for within line selection or for marker assisted introgression using linked markers, markers in disequilibrium or alleles comprising causative mutations.

The invention furthermore provides an animal selected by using a method according to the invention. For example, a pig characterised in being homozygous for an allele in a QTL located at a *Sus scrofa* chromosome 2 mapping at position 2p1.7 can now be selected and is thus provided by the invention. Since said QTL is related to the potential muscle mass and/or fat deposition of said pig and/or said QTL comprises at least a part of a *Sus scrofa* insulin-like growth factor-2 (IGF2) allele, it is

possible to select promising pigs to be used for breeding or to be slaughtered. In particular an animal according to the invention which is a male is provided. Such a male, or its sperm or an embryo derived thereof can advantageously be used in breeding animals for creating breeding lines or for finally breeding animals destined for slaughter. In a preferred embodiment of such use as provided by the invention, a male, or its sperm, deliberately selected for being homozygous for an allele causing the extreme muscular hyperthrophy and leanness, is used to produce offspring heterozygous for such an allele. Due to said allele's paternal expression, said offspring will also show the favourable traits for example related to muscle mass, even if the parent female has a different genetic background. Moreover, it is now possible to positively select the female(s) for having different traits, for example related to fertility, without having a negative effect on the muscle mass trait that is inherited from the allele from the selected male. For example, earlier such males could occasionally be seen with Piétrain pigs but genetically it was not understood how to most profitably use these traits in breeding programmes.

Furthermore, the invention provides a transgenic animal, sperm and an embryo derived thereof, comprising a synthetic parentally imprinted QTL or functional fragment thereof as provided by the invention, i.e. it is provided by the invention to introduce a favourable recombinant allele; for example introduce the oestrogen receptor locus related to increased litter size of an animal homozygously in a parentally imprinted region of a grandparent animal (for example the father of a hybrid sow if the region was paternally imprinted and the grandparent was a boar); to introduce a favourable fat-related allele or muscle mass-related recombinant allele in a paternally imprinted region, and so on. Recombinant alleles that are interesting or favourable from the maternal side or often the ones that have opposite effects to alleles from the paternal side. For example,

in meat animals such as pigs recombinant alleles linked with meat quality traits such as intra-muscular fat or muscle mass could be fixed in the dam lines while recombinant alleles linked with reduced back fat could be fixed in the sire lines. Other desirable combinations are for example fertility and/or milk yield in the female line with growth rates and/or muscle mass in the male lines.

The invention is further explained in the detailed description without limiting the invention.

Detailed description.

Example 1: Wild Boar x Large White intercrosses

15

Methods

Isolation of an *IGF2* BAC clone and fluorescent *in situ* hybridization (FISH). *IGF2* primers (F:5'-GGCAAGTTCTTCCGCTAATGA-3' and R:5'-GCACCGCAGAATTACGACAA-3') for PCR amplification of a part of the last exon and 3'UTR were designed on the basis of a porcine *IGF2* cDNA sequence (GenBank X56094). The primers were used to screen a porcine BAC library and the clone 253G10 was isolated. Crude BAC DNA was prepared as described²⁴. The BAC DNA was linearized with *EcoRV* and purified with QIAEXII (QIAGEN GmbH, Germany). The clone was labeled with biotin-14-dATP using the GIBCO-BRL Bionick labeling system (BRL18246-015). Porcine metaphase chromosomes were obtained from pokeweed (Seromed) stimulated lymphocytes using standard techniques. The slides were aged for two days at room temperature and then kept at -20°C until use. FISH analysis was carried out as previously described²⁵. The final concentration of the probe in the hybridization mix was 10 ng/μl. Repetitive sequences were suppressed with standard concentrations of porcine

genomic DNA. After post-hybridization washing, the biotinylated probe was detected with two layers of avidin-FITC (Vector A-2011). The chromosomes were counterstained with 0.3 mg/ml DAPI (4,6-Diamino-2-phenylindole; Sigma D9542), which produced a G-banding like pattern. No posthybridization banding was needed, since chromosome 2 is easily recognized without banding. A total of 20 metaphase spreads were examined under an Olympus BX-60 fluorescence microscope connected to an IMAC-CCD S30 video camera and equipped with an ISIS 1.65 (Metasystems) software.

Sequence, microsatellite, and linkage analysis.

About two µg of linearized and purified BAC DNA was used for direct sequencing with 20 pmoles of primers and BigDye Terminator chemistry (Perkin Elmer, USA). DNA sequencing was done from the 3' end of the last exon towards the 3' end of the UTR until a microsatellite was detected. A primer set (F:5'-GTTTCTCCTGTACCCACACGCATCCC-3' and R:5'-Fluorescein-CTACAAGCTGGGCTCAGGG-3') was designed for the amplification of the *IGF2* microsatellite which is about 250 bp long and located approximately 800 bp downstream from the stop codon. The microsatellite was PCR amplified using fluorescently labeled primers and the genotyping was carried out using an ABI377 sequencer and the GeneScan/Genotyper softwares (Perkin Elmer, USA). Two-point and multipoint linkage analysis were done with the Cri-Map software²⁶.

30

Animals and phenotypic data.

The intercross pedigree comprised two European Wild Boar males and eight Large White females, 4 F₁ males and 22 F₁ females, and 200 F₂ progeny¹. The F₂ animals were sacrificed at a live weight of at least 80 kg or at a

35

maximum age of 190 days. Phenotypic data on birth weight, growth, fat deposition, body composition, weight of internal organs, and meat quality were collected; a detailed description of the phenotypic traits are
5 provided by Andersson *et al.*¹ and Andersson-Eklund *et al.*⁴

Statistical analysis.

10 Interval mapping for the presence of QTL were carried out with a least squares method developed for the analysis of crosses between outbred lines²⁷. The method is based on the assumption that the two divergent lines are fixed for alternative QTL alleles. There are four possible
15 genotypes in the F_2 generation as regards the grandparental origin of the alleles at each locus. This makes it possible to fit three effects: additive, dominance, and imprinting². The latter is estimated as the difference between the two types of heterozygotes,
20 the one receiving the Wild Boar allele through an F_1 sire and the one receiving it from an F_1 dam. An F-ratio was calculated using this model (with 3 d.f.) versus a reduced model without a QTL effect for each cM of chromosome 2. The most likely position of a QTL was
25 obtained as the location giving the highest F-ratio. Genome-wise significance thresholds were obtained empirically by a permutation test²⁸ as described². The QTL model including an imprinting effect was compared with a model without imprinting (with 1 d.f.) to test
30 whether the imprinting effect was significant.

The statistical models also included the fixed effects and covariates that were relevant for the respective traits; see Andersson-Eklund *et al.*⁴ for a more detailed description of the statistical models used.
35 Family was included to account for background genetic

effects and maternal effects. Carcass weight was included as a covariate to discern QTL effects on correlated traits, which means that all results concerning body composition were compared at equal weights. Least-squares means for each genotype class at the *IGF2* locus were estimated with a single point analysis using Procedure GLM of SAS²⁹; the model included the same fixed effects and covariates as used in the interval mapping analyses. The QTL shows a clear parent of origin-specific expression and the map position coincides with that of the insulin-like growth factor II gene (*IGF2*), indicating *IGF2* as the causative gene. A highly significant segregation distortion (excess of Wild Boar-derived alleles) was also observed at this locus. The results demonstrate an important effect of the *IGF2* region on postnatal development and it is possible that the presence of a paternally expressed *IGF2*-linked QTL in humans and in rodent model organisms has so far been overlooked due to experimental design or statistical treatment of data. The study has also important implications for quantitative genetics theory and practical pig breeding.

IGF2 was identified as a positional candidate gene for this QTL due to the observed similarity between pig chromosome 2p and human chromosome 11p. A genomic *IGF2* clone was isolated by screening a porcine BAC library. FISH analysis with this BAC clone gave a strong consistent signal on the terminal part of chromosome 2p (Fig. 1). A polymorphic microsatellite is located in the 3'UTR of *IGF2* in mice (GenBank U71085), humans (GenBank S62623), and horse (GenBank AF020598). The possible presence of a corresponding porcine microsatellite was investigated by direct sequencing of the *IGF2* 3'UTR using the BAC clone. A complex microsatellite was identified about 800 bp downstream of the stop codon; a sequence comparison revealed that this microsatellite is identical

to a previously described anonymous microsatellite, *Swc96*. PCR primers were designed and the microsatellite (*IGF2ms*) was found to be highly polymorphic with three different alleles among the two Wild Boar founders and
5 another two among the eight Large White founders. *IGF2ms* was fully informative in the intercross as the breed of origin as well as the parent of origin could be determined with confidence for each allele in each F_2 animal.

10 A linkage analysis using the intercross pedigree was carried out with *IGF2ms* and the microsatellites *Sw2443*, *Sw2623*, and *Swr2516*, all from the distal end of 2p⁷. *IGF2* was firmly assigned to 2p by highly significant lod scores (e.g. $Z=89.0$, $\theta=0.003$ against *Swr2516*). Multipoint
15 analyses, including previously typed chromosome 2 markers⁸, revealed the following order of loci (sex-average map distances in Kosambi cM): *Sw2443/Swr2516*-0.3-*IGF2*-14.9-*Sw2623*-10.3-*Sw256*. No recombinant was observed between *Sw2443* and *Swr2516*, and the suggested proximal
20 location of *IGF2* in relation to these loci is based on a single recombinant giving a lod score support of 0.8 for the reported order. The most distal marker in our previous QTL study, *Sw256*, is located about 25 cM from the distal end of the linkage group.

25 QTL analyses of body composition, fatness, meat quality, and growth traits were carried out with the new chromosome 2 map using a statistical model testing for the possible presence of an imprinting effect as expected for *IGF2*. Clear evidence for a paternally expressed QTL
30 located at the very distal tip of 2p was obtained (Fig. 2; Table 1). The QTL had very large effects on lean meat content in ham and explained an astonishing 30% of the residual phenotypic variance in the F_2 population. Large effects on the area of the longissimus dorsi muscle, on
35 the weight of the heart, and on back-fat thickness

(subcutaneous fat) were also noted. A moderate effect on one meat quality trait, reflectance value, was indicated. The QTL had no significant effect on abdominal fat, birth weight, growth, weight of liver, kidney, or spleen (data not shown). The Large White allele at this QTL was associated with larger muscle mass and reduced back-fat thickness consistent with the difference between this breed and the Wild Boar population. The strong imprinting effect observed for all affected traits strongly suggests a single causative locus. The pleiotropic effects on skeletal muscle mass and the size of the heart appear adaptive from a physiological point of view as a larger muscle mass requires a larger cardiac output. The clear paternal expression of this QTL is illustrated by the least squares means which fall into two classes following the population origin of the paternally inherited allele (Table 1). It is worth noticing though that there was a non-significant trend towards less extreme values for the two heterozygous classes, in particular for the estimated effect on the area of longissimus dorsi. This may be due to chance, but could have a biological explanation, e.g. that there is some expression of the maternally inherited allele or that there is a linked, non-imprinted QTL with minor effects on the traits in question.

The *IGF2*-linked QTL and the *FAT1* QTL on chromosome 4, 9 are by far the two loci with the largest effect on body composition and fatness segregating in this Wild Boar intercross. The *IGF2* QTL controls primarily muscle mass whereas *FAT1* has major effects on fat deposition including abdominal fat, a trait that was not affected by the *IGF2* QTL (Fig. 2). No significant interaction between the two loci was indicated and they control a very large proportion of the residual phenotypic variance in the F_2 generation. A model including both QTLs explains 33.1% of the variance for percentage lean meat in ham, 31.3% for the percentage of lean meat plus bone in back, and 26.2%

for average back fat depth (compare with a model including only chromosome 2 effects, Table 1). The two QTLs must have played a major role in the response during selection for lean growth and muscle mass in the Large White domestic pig.

A highly significant segregation distortion was observed in the *IGF2* region (excess of Wild Boar-derived alleles) as shown in Table 1 ($\chi^2=11.7$, d.f.=2; $P=0.003$). The frequency of Wild Boar-derived *IGF2* alleles was 59% in contrast to the expected 50% and there was twice as many "Wild Boar" as "Large White" homozygotes. This deviation was observed with all three loci at the distal tip and is thus not due to typing errors. The effect was also observed with other loci but the degree of distortion decreased as a function of the distance to the distal tip of the chromosome. Blood samples for DNA preparation were collected at 12 weeks of age and we are convinced that the deviation from expected Mendelian ratios was present at birth as the number of animals lost prior to blood sampling was not sufficient to cause a deviation of this magnitude. No other of the more than 250 loci analyzed in this pedigree show such a marked segregation distortion (L. Andersson, unpublished). The segregation distortion did not show an imprinting effect, as the frequencies of the two reciprocal types of heterozygotes were identical (Table 1). This does not exclude the possibility that the QTL effects and the segregation distortion are controlled by the same locus. The segregation distortion maybe due to meiotic drive favoring the paternally expressed allele during gametogenesis, as the F_1 parents were all sired by Wild Boar males. Another possibility is that the segregation distortion may be due to codominant expression of the maternal and paternal allele in some tissues and/or during a critical period of embryo development. Biallelic *IGF2* expression has been reported to occur to some extent

during human development^{10, 11} and interestingly a strong influence of the parental species background on *IGF2* expression was recently found in a cross between *Mus musculus* and *Mus spretus*¹². It is also interesting that a VNTR polymorphism at the insulin gene, which is very closely linked to *IGF2*, is associated with size at birth in humans¹³. It is possible that the *IGF2*-linked QTL in pigs has a minor effect on birth weight but in our data it was far from significant (Fig. 2) and there was no indication of an imprinting effect.

This study is an advance in the general knowledge concerning the biological importance of the *IGF2* locus. The important role of *IGF2* for prenatal development is well-documented from knock-out mice¹⁴ as well as from its causative role in the human Beckwith-Wiedemann syndrome¹⁵. This study demonstrates an important role for the *IGF2*-region also for postnatal development. It should be stressed that our intercross between outbred populations is particularly powerful to detect QTL with a parent of origin-specific effect on a multifactorial trait. This is because multiple alleles (or haplotypes) are segregating and we could deduce whether a heterozygous F₂ animal received the Wild Boar allele from the F₁ male or female. It is quite possible that the segregation of a paternally expressed *IGF2*-linked QTL affecting a trait like obesity has been overlooked in human studies or in intercrosses between inbred rodent populations because of experimental design or statistical treatment of data. An imprinting effect cannot be detected in an intercross between two inbred lines as only two alleles are segregating at each locus. Our result has therefore significant bearings on the future analysis of the association between genetic polymorphism in the *insulin-IGF2* region and Type I diabetes¹⁶, obesity¹⁷, and variation in birth weight¹³ in humans, as

well as for the genetic dissection of complex traits using inbred rodent models. A major impetus for generating an intercross between the domestic pig and its wild ancestor was to explore the possibilities to map and identify major loci that have responded to selection. We have now showed that two single QTLs on chromosome 2 (this study) and 4^{1, 2} explain as much as one third of the phenotypic variance for lean meat content in the F₂ generation. This is a gross deviation from the underlying assumption in the classical infinitesimal model in quantitative genetics theory namely that quantitative traits are controlled by an infinite number of loci each with an infinitesimal effect. If a large proportion of the genetic difference between two divergent populations (e.g. Wild Boar and Large White) is controlled by a few loci, one would assume that selection would quickly fix QTL alleles with large effects leading to a selection plateau. However, this is not the experience in animal breeding programs or selection experiments where good persistent long-term selection responses are generally obtained, provided that the effective population size is reasonably large¹⁸. A possible explanation for this paradox is that QTL alleles controlling a large proportion of genetic differences between two populations may be due to several consecutive mutations; this may be mutations in the same gene or at several closely linked genes affecting the same trait. It has been argued that new mutations contribute substantially to long-term selection responses¹⁹, but the genomic distribution of such mutations are unknown.

The search for a single causative mutation is the paradigm as regards the analysis of genetic defects in mice and monogenic disorders in humans. We propose that this may not be the case for loci that have been under selection for a large number of generations in domestic animals, crops, or natural populations. This hypothesis

predicts the presence of multiple alleles at major QTL. It gains some support from our recent characterization of porcine coat color variation. We have found that both the alleles for dominant white color and for black-spotting
5 differ from the corresponding wild-type alleles by at least two consecutive mutations with phenotypic effects at the *KIT* and *MC1R* loci, respectively^{20, 21}. In this context it is highly interesting that in the accompanying example we have identified a third allele at the *IGF2*-
10 linked QTL. The effects on muscle mass of the three alleles rank in the same order as the breeds in which they are found i.e. Piétrain pigs are more muscular than Large White pigs that in turn have higher lean meat content than Wild Boars.

15 There are good reasons to decide that *IGF2* is the causative gene for the now reported QTL. Firstly, there is a perfect agreement in map localization (Fig. 2). Secondly, it has been shown that *IGF2* is paternally expressed in mice, humans, and now in pigs, like the QTL.
20 There are several other imprinted genes in the near vicinity of *IGF2* in mice and humans (*Mash2*, *INS2*, *H19*, *KVLQT1*, *TAPA1/CD81*, and *CDKN1C/p57^{KIP2}*) but only *IGF2* is paternally expressed in adult tissues²². We believe that this locus provides a unique opportunity for molecular
25 characterization of a QTL. The clear paternal expression can be used to exclude genes that do not show this mode of inheritance. Moreover, the presence of an allelic series should facilitate the difficult distinction between causative mutations and linked neutral
30 polymorphism. We have already shown that there is no difference in coding sequence between *IGF2* alleles from Piétrain and Large White pigs suggesting that the causative mutations occur in regulatory sequences. An obvious step is to sequence the entire *IGF2* gene and its
35 multiple promoters from the three populations. The recent

report that a VNTR polymorphism in the promoter region of the insulin (*INS*) gene affects *IGF2* expression²³ suggests that the causative mutations may be at a considerable distance from the *IGF2* coding sequence.

- 5 The results have several important implications for the pig breeding industry. They show that genetic imprinting is not an esoteric academic question but need to be considered in practical breeding programs. The detection of three different alleles in Wild Boar, Large
- 10 White, and Piétrain populations indicates that further alleles at the *IGF2*-linked QTL segregate within commercial populations. The paternal expression of the QTL facilitates its detection using large paternal half-sib families as the female contribution can be ignored.
- 15 The QTL is exploited to improve lean meat content by marker assisted selection within populations or by marker assisted introgression of favorable alleles from one population to another.

Example 2: Piétrain x Large White intercrosses

Methods

- Pedigree material:* The pedigree material utilized to map
- 5 QTL was selected from a previously described Piétrain x Large White F2 pedigree comprising > 1,800 individuals^{6,7}. To assemble this F2 material, 27 Piétrain boars were mated to 20 Large White sows to generate an F1 generation comprising 456 individuals. 31 F1 boars were mated to
- 10 unrelated 82 F1 sows from 1984 to 1989, yielding a total of 1862 F2 offspring. F1 boars were mated on average to 7 females, and F1 sows to an average of 2,7 males. Average offspring per boar were 60 and per sow 23.
- 15 *Phenotypic information: (i) Data collection:* A total of 21 distinct phenotypes were recorded in the F2 generation^{6,7}. These included:
- five growth traits: birth weight (g), weaning weight (Kg), grower weight (Kg), finisher weight (Kg) and
 - 20 average daily gain (ADG; Kg/day; grower to finisher period);
 - two body proportion measurements: carcass length (cm); and a conformation score (0 to 10 scale; ref.6);
 - ten measurements of carcass composition obtained by
 - 25 dissection of the chilled carcasses 24 hours after slaughter. These include measurements of muscularity: % ham (weight hams/carcass weight), % loin (weight loin/carcass weight), % shoulder (weight
 - 30 shoulder/carcass weight), % lean cuts (% ham + %loin + % shoulder); and measurements of fatness: average back-fat thickness (BFT; cm), % backfat (weight backfat/carcass weight), % belly (weight belly/carcass weight), % leaf fat (weight leaf fat/carcass weight), % jowl (weight jowl/carcass weight), and "% fat cuts" (% backfat + %
 - 35 belly + % leaft fat + % jowl).
 - four meat quality measurements: pH_{LD1} (*Longissimus dorsi* 1

hour after slaughter), pH_{LD24} (*Longissimus dorsi* 24 hours after slaughter), pH_{G1} (*Gracilis* 1 hour after slaughter) and pH_{G24} (*Gracilis* 24 hours after slaughter). (ii) *Data*

processing: Individual phenotypes were preadjusted for fixed effects (sire, dam, CRC genotype, sex, year-season, parity) and covariates (litter size, birth weight, weaning weight, grower weight, finisher weight) that proved to significantly affect the corresponding trait. Variables included in the model were selected by stepwise regression.

10

Marker genotyping: Primer pairs utilized for PCR amplification of microsatellite markers are as described¹⁹. Marker genotyping was performed as previously described²⁰. Genotypes at the *CRC* and *MyoD* loci were determined using conventional methods as described^{1,12}. The LAR test for the *Igf2* SNP was developed according to Baron et al.²¹ using a primer pair for PCR amplification (5'-CCCCTGAAGTTGAGGACGAGCAGCC-3'; 5'-ATCGCTGTGGGCTGGGCTGGGCTGCC-3') and a set of three primers for the LAR step (5'-FAM-CGCCCCAGCTGCCCCCAG-3'; 5'-HEX-CGCCCCAGCTGCCCCCAA-3'; 5'-CCTGAGCTGCAGCAGGCCAG-3').

15

20

Map construction: Marker maps were constructed using the TWOPOINT, BUILD and CHROMPIC options of the CRIMAP package²². To allow utilisation of this package, full-sib families related via the boar or sow were disconnected and treated independently. By doing so, some potentially usable information was neglected, yielding, however, unbiased estimates of recombination rates.

25

30

QTL mapping: (i) *Mapping Mendelian QTL:* Conventional QTL mapping was performed using a multipoint maximum likelihood method. The applied model assumed one segregating QTL per

chromosome, and fixation of alternate QTL alleles in the respective parental lines, Piétrain (P) and Large White (LW). A specific analysis program had to be developed to account for the missing genotypes of the parental generation, resulting in the fact that the parental origin of the F1 chromosomes could not be determined. Using a typical "interval mapping" strategy, an hypothetical QTL was moved along the marker map using user-defined steps. At each position, the likelihood (L) of the pedigree data was computed as:

$$L = \sum_{\varphi=1}^{2^r} \prod_{i=1}^n \sum_{G=1}^4 (P(G|M_i, \theta, \varphi) P(y_i|G))$$

P or right chromosome P), there is a total of 2^r combinations for r F1 parents.

$$\prod_{i=1}^n n \text{ F2}$$

$\sum_{G=1}^4$ i th F2 offspring, over the four possible QTL genotypes:

P/P , P/LW , LW/P and LW/LW

$P(G|M_i, \theta, \varphi)$: the marker genotype of the i th F2 offspring and its F1 parents, (ii) : the vector of recombination rates

between adjacent markers and between the hypothetical QTL and its flanking markers, and (iii) θ the considered marker-QTL phase combination of the F1 parents.

Recombination rates and marker linkage phase of F1 parents are assumed to be known when computing this probability. Both were determined using CRIMAP in the map construction phase (see above).

$P(y_i|G)$ of offspring i , given the QTL genotype under consideration. This probability is computed from the normal density function:

$$P(y_i|G) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(y_i - \mu_G)^2}{2\sigma^2}}$$

μ_G is the phenotypic mean of the considered QTL genotype (PP, PL, LP or LL) and σ^2 the residual variance σ^2 was considered to be the same for the four QTL genotypic classes.

- 5 The values of μ_{PP} , $\mu_{PL}=\mu_{LP}$, μ_{LL} and σ^2 maximizing L were determined using the GEMINI optimisation routine²³.

The likelihood obtained under this alternative H_1 hypothesis was compared with the likelihood obtained under the null hypothesis H_0 of no QTL, in which the phenotypic means of the
10 four QTL genotypic classes were forced to be identical. The difference between the logarithms of the corresponding likelihoods yields a lodscore measuring the evidence in favour of a QTL at the corresponding map position.

- (ii) *Significance thresholds*: Following Lander & Botstein²⁴,
15 lodscore thresholds (T) associated with a chosen genome-wide significance level, were computed such that:

$$\alpha = (C + 9.21GT)\chi^2_2(4.6T)$$

- C corresponds to the number of chromosomes (= 19), G corresponds to the length of the genome in Morgans (= 29),
20 and $\chi^2_2(4.6T)$ denotes one minus the cumulative distribution function of the chi-squared distribution with 2 d.f. Single point $2\ln(LR)$ were assumed to be distributed as a chi-squared distribution with two degrees of freedom, as we were fitting both an additive and dominance component. To account for the
25 fact that we were analysing multiple traits, significance levels were adjusted by applying a Bonferoni correction corresponding to the effective number of independent traits that were analyzed. This effective number was estimated at 16 following the approach described by Spelman et al.²⁵.
30 Altogether, this allowed us to set the lodscore threshold associated with an experiment-wise significance level of 5%

at 5.8. When attempting to confirm the identified QTL in an independent sample, the same approach was used, however, setting C at 1, G at 25cM and correcting for the analysis of 4.5 independent traits (as only six traits were analyzed in this sample). This yielded a lodscore threshold associated with a Type I error of 5% of 2.

(iii). *Testing for an imprinted QTL*: To test for an imprinted QTL, we assumed that only the QTL alleles transmitted by the parent of a given sex would have an effect on phenotype, the QTL alleles transmitted by the other parent being "neutral". The likelihood of the pedigree data under this hypothesis was computed using equation 1. To compute $P(y_i | G)$, however, the phenotypic means of the four QTL genotypes were set at $\mu_{PP} = \mu_{PL} = \mu_P$ and $\mu_{LP} = \mu_{LL} = \mu_L$ to test for a QTL for which the paternal allele only is expressed, and $\mu_{PP} = \mu_{LP} = \mu_P$ and $\mu_{PL} = \mu_{LL} = \mu_L$ to test for a QTL for which the maternal allele only is expressed. It is assumed in this notation that the first subscript refers to the paternal allele, the second subscript to the maternal allele. H_0 was defined as the null-hypothesis of no QTL, H_1 testing the presence of a Mendelian QTL; H_2 testing the presence of a paternally expressed QTL, and H_3 testing the presence of a maternally expressed QTL.

RT-PCR: Total RNA was extracted from skeletal muscle according to Chirgwin et al.²⁶. RT-PCR was performed using the Gene-Amp RNA PCR Kit (Perkin-Elmer) The PCR products were purified using QiaQuick PCR Purification kit (Qiagen) and sequenced using Dye terminator Cycle Sequencing Ready Reaction (Perkin Elmer) and an ABI373 automatic sequencer.

In example 2 we report the identification of a QTL with major effect on muscle mass and fat deposition mapping to porcine 2p1.7. The QTL shows clear evidence for parental imprinting strongly suggesting the involvement of the *Igf2* locus.

5 A Piétrain X Large White intercross comprising 1125 F₂ offspring was generated as described^{6,7}. The Large White and Piétrain parental breeds differ for a number of economically important phenotypes. Piétrains are famed for their exceptional muscularity and leanness⁸ (Figure 2), while Large
10 Whites show superior growth performance. Twenty-one distinct phenotypes measuring (i) growth performance (5), (ii) muscularity (6), (iii) fat deposition (6), and (iv) meat quality (4), were recorded on all F₂ offspring.

 In order to map QTL underlying the genetic differences
15 between these breeds, we undertook a whole genome scan using microsatellite markers on an initial sample of 677 F₂ individuals. Analysis of pig chromosome 2 using a ML multipoint algorithm, revealed highly significant lodscores (up to 20) for six of the 12 phenotypes measuring muscularity
20 and fat deposition at the distal end of the short arm of chromosome 2 (Figure 3a). Positive lodscores were obtained for the remaining six phenotypes, however, not reaching the genome-wide significance threshold ($\alpha = 5\%$). To confirm this finding, the remaining sample of 355 F₂ offspring was
25 genotyped for the five most distal 2p markers and QTL analysis performed for the traits yielding the highest lodscores in the first analysis. Lodscores ranged from 2.1 to 7.7, clearly confirming the presence of a major QTL in this region. Table 2 reports the corresponding ML estimates for
30 the three genotypic means as well as the corresponding residual variance.

 Bidirectional chromosome painting establishes a correspondence between SSC2p and HSA11pter-q13^{9,10}. At least

two serious candidate genes map to this region in man: the myogenic basic helix-loop-helix factor, MyoD, maps to HSA11p15.4, while Igf2 maps to HSA11p15.5. MyoD is a well known key regulator of myogenesis and is one of the first myogenic markers to be switched on during development¹¹. A previously described amplified sequence polymorphism in the porcine MyoD gene¹² proved to segregate in our F₂ material, which was entirely genotyped for this marker. Linkage analysis positioned the MyoD gene in the SW240-SW776 (odds > 1000) interval, therefore well outside the lod-2 drop off support interval for the QTL (figure 1). Igf2 is known to enhance both proliferation and differentiation of myoblasts in vitro¹³ and to cause a muscular hypertrophy when overexpressed in vivo. Based on a published porcine adult liver cDNA sequence¹⁴, we designed primer pairs allowing us to amplify the entire Igf2 coding sequence with 222 bp of leader and 280 bp of trailer sequence from adult skeletal muscle cDNA. Piétrain and Large White RT-PCR products were sequenced indicating that the coding sequence was identical in both breeds and with the published sequence. However, a transition was found in the leader sequence corresponding to exon 2 in man (Figure 4). We developed a screening test for this single nucleotide polymorphism (SNP) based on the ligation amplification reaction (LAR), allowing us to genotype our pedigree material. Based on these data, Igf2 was shown to colocalize with the SWC9 microsatellite marker (= 0%), therefore located at approximately 2 centimorgan from the most likely position of the QTL and well within the 95% support interval for the QTL (figure 1). Subsequent sequence analysis demonstrated that the microsatellite marker SWC9 is actually located within the 3' UTR of the Igf2 gene. Combined with available comparative mapping data for the PGA and FSH loci, these results suggest the occurrence of an interstitial

inversion of a chromosome segment containing *MyoD*, but not *Igf2* which has remained telomeric in both species.

Igf2 therefore appeared as a strong positional allele having the observed QTL effect. In man and mouse, *Igf2* is known to be imprinted and to be expressed exclusively from the paternal allele in several tissues¹⁵. Analysis of skeletal muscle cDNA from pigs heterozygous for the SNP and/or SWC9, shows that the same imprinting holds in this tissue in the pig as well (Figure 4). Therefore if *Igf2* were responsible for the observed effect, and knowing that only the paternal *Igf2* allele is expressed, one can predict that (i) the paternal allele transmitted by F1 boars (P or LW) would have an effect on phenotype of F2 offspring, (ii) the maternal allele transmitted by F1 sows (P or LW) would have no effect on phenotype of F2 offspring, and (iii) the likelihood of the data would be superior under a model of a bimodal (1:1) F2 population sorted by inherited paternal allele when compared to a conventional "Mendelian" model of a trimodal (1:2:1) F2 population. The QTL mapping programs were adapted in order to allow testing of the corresponding hypotheses. H_0 was defined as the null-hypothesis of no QTL, H_1 as testing for the presence of a Mendelian QTL, H_2 as testing for the presence of a paternally expressed QTL, and H_3 as testing for the presence of a maternally expressed QTL.

Figure 3 summarizes the obtained results. Figure 3a, 3b and 3c respectively show the lodscore curves corresponding to $\log_{10} (H_2/H_0)$, $\log_{10} (H_3/H_0)$ and $\log_{10} (H_2/H_1)$. It can be seen that very significant lodscores are obtained when testing for the presence of a paternally expressed QTL, while there is no evidence at all for the segregation of a QTL when studying the chromosomes transmitted by the sows. Also, the hypothesis of a paternally expressed QTL is significantly more likely ($\log_{10} (H_2/H_1) > 3$) than the hypothesis of a "Mendelian" QTL

for all examined traits. The fact that the same tendency is observed for all traits indicates that it is likely the same imprinted gene that is responsible for the effects observed on the different traits. Table 2 reports the ML phenotypic means for the F2 offspring sorted by inherited paternal QTL allele. Note that when performing the analysis under a model of a mendelian QTL, the Piétrain and Large White QTL alleles appeared to behave in an additive fashion, the heterozygous genotype exhibiting a phenotypic mean corresponding exactly to the midpoint between the two homzygous genotypes. This is exactly what one would predict when dealing with an imprinted QTL as halve of the heterozygous offspring are expected to have inherited the P allele from their sire, the other halve the LW allele.

These data therefore confirmed our hypothesis of the involvement of an imprinted gene expressed exclusively from the paternal allele. The fact that the identified chromosomal segment coincides precisely with an imprinted domain documented in man and mice strongly implicates the orthologous region in pigs. At least seven imprinted genes mapping to this domain have been documented (*Igf2*, *Ins2*, *H19*, *Mash2*, *p57^{KIP2}*, *KvLQTL1* and *TDAG51*) (ref. 15 and Andrew Feinberg, personal communication). Amongst these, only *Igf2* and *Ins2* are paternally expressed. While we cannot exclude that the observed QTL effect is due to an as of yet unidentified imprinted gene in this region, its reported effects on myogenesis *in vitro* and *in vivo*¹³ strongly implicate *Igf2*. Particularly the muscular hypertrophy observed in transgenic mice overexpressing *Igf2* from a muscle specific promotor are in support of this hypothesis (Nadia Rosenthal, personal communication. Note that allelic variants of the *INS* VNTR have recently been shown to be associated

with size at birth in man¹⁶, and that the same VNTR has been shown to affect the level of *Igf2* expression¹⁷.

The observation of the same QTL effect in a Large White x Wild Boar intercross indicates the existence of a series of at least three distinct functional alleles. Moreover, preliminary evidence based on marker assisted segregation analysis points towards residual segregation at this locus within the Piétrain population (data not shown). The occurrence of an allelic series might be invaluable in identifying the causal polymorphisms which - based on the quantitative nature of the observed effect - are unlikely to be gross gene alterations but rather subtle regulatory mutations.

The effects of the identified QTL on muscle mass and fat deposition are truly major, being of the same magnitude of those reported for the *CRC* locus^{6,7} though apparently without the associated deleterious effects on meat quality. We estimate that both loci jointly explain close to 50% of the Piétrain versus Large White breed difference for muscularity and leanness. Understanding the parent-of-origin effect characterizing this locus will allow for its optimal use in breeding programs. Indeed, today half of the offspring from commercially popular Piétrain x Large White crossbred boars inherit the unfavourable Large White allele causing considerable loss.

The QTL described in this work is the second example of a gene affecting muscle development in livestock species that exhibits a non-mendelian inheritance pattern. Indeed, we have previously shown that the callipyge locus (related to the qualitative trait wherein muscles are doubled) is characterized by polar overdominance in which only the heterozygous individuals that inherit the CLPG mutation from their sire express the double-muscling phenotype⁵. This

demonstrates that parent-of-origin effects affecting genes underlying production traits in livestock might be relatively common.

5 Example 3:

Generating a reference sequence of IGF2 and flanking loci in the pig.

10 The invention provides an imprinted QTL with major effect on muscle mass mapping to the IGF2 locus in the pig, and use of the QTL as tool in marker assisted selection. To fine tune this tool for marker assisted selection, as well as to further identify a causal mutation, we have further generated
15 a reference sequence encompassing the entire porcine IGF2 sequence as well as that from flanking genes.

To achieve this, we screened a porcine BAC library with IGF2 probes and identified two BACs. BAC-PIGF2-1 proved to
20 contain the INS and IGF2 genes, while BAC-PIGF2-2 proved to contain the IGF2 and H19 genes. The NotI map as well as the relative position of the two BACs is shown in Figure 5. BAC-PIGF2-1 was shotgun sequenced using standard procedures and automatic sequencers. The resulting sequences were assembled
25 using standard software yielding a total of 115 contigs. The corresponding sequences are reported in figure 6. Similarity searches were performed between the porcine contigs and the orthologous sequences in human. Significant homologies were detected for 18 contigs and are reported in Figure 7.

30

For BAC-PIGF2-2, the 24 Kb NotI fragment not present in BAC-PIGF2-1 was subcloned and sequenced using the EZ::TN transposon approach and ABI automatic sequencers. Resulting

sequences were assembled using the Phred-Phrap-Consed program suit, yielding seven distinct contigs (figure 8). The contig sequences were aligned with the corresponding orthologous human sequences using the compare and dotplot programs of the GCG suite. Figure 9 summarizes the corresponding results.

Example 4: Identification of DNA sequence polymorphisms in the IGF2 and flanking loci.

Based on the reference sequence obtained as described in Example 1, we resequenced part of the IGF2 and flanking loci from genomic DNA isolated from Piétrain, Large White and Wild Boar individuals, allowing identification of DNA sequence polymorphisms such as reported in figure 10.

15

Legends to the figures

Fig. 1: Test statistic curves obtained in QTL analyses of
5 chromosome 2 in a Wild Boar/Large White intercross. The graph
plots the F ratio testing the hypothesis of a single QTL at a
given position along the chromosome for the traits indicated.
The marker map with the distances between markers in Kosambi
10 centiMorgan is given on the X-axis. The horizontal lines
represent genome-wise significant ($P < 0.05$) and suggestive
levels for the trait lean meat in ham; similar significance
thresholds were obtained for the other traits.

Figure 2: Piétrain pig with characteristic muscular
15 hypertrophy.

Figure 3: Lodscore curves obtained in a Piétrain x Large
White intercross for six phenotypes measuring muscle mass and
fat deposition on pig chromosome 2. The most likely positions
20 of the *Igf2* and *MyoD* genes determined by linkage analysis
with respect to the microsatellite marker map are shown. H_0
was defined as the null-hypothesis of no QTL, H_1 as testing
for the presence of a Mendelian QTL, H_2 as testing for the
presence of a paternally expressed QTL, and H_3 as testing for
25 the presence of a maternally expressed QTL. 3a: $\log_{10}(H_1/H_0)$,
3b: $\log_{10}(H_2/H_0)$, 3c: $\log_{10}(H_3/H_0)$

Figure 4: A. Structure of the human *Igf2* gene according to
ref. 17, with aligned porcine adult liver cDNA sequence as
30 reported in ref. 16. The position of the nt241(G-A)
transition and *Swc9* microsatellite are shown. B. The
corresponding markers were used to demonstrate the
monoallelic (paternal) expression of *Igf2* in skeletal muscle

and liver of 10-week old fetuses. PCR amplification of the *nt421(G-A)* polymorphism and *Swc9* microsatellite from genomic DNA clearly shows the heterozygosity of the fetus, while only the paternal allele is detected in liver cDNA (*nt421(G-A)* and *Swc9*) and muscle cDNA (*Swc9*). The absence of RT-PCR product for *nt421(G-A)* from in fetal muscle points towards the absence of mRNA including exon 2 in this tissue. Parental origin of the foetal alleles was determined from the genotypes of sire and dam (data not shown).

10

Figure 5: A NotI restriction map showing the relative position of BAC-PIGF2-1 (comprising INS and IGF2 genes), and BAC-PIGF2-2 (comprising IGF2 and H19 genes).

15 Figure 6: Nucleic acid sequences of contig 1 to contig 115 derived from BAC-PIGF2-1 which was shotgun sequenced using standard procedures and automatic sequencers.

Figure 7: Similarity between porcine contigs of figure 6 and orthologous sequences in human.

20

Figure 8 Nucleic acid sequences of contig 1 to contig 7 derived from BAC-PIGF2-2, (the 24 Kb NotI fragment not present in BAC-PIGF2-1) which was subcloned and sequenced using the EZ::TN transposon approach and ABI automatic sequencers.

25

Figure 9: Similarity between porcine contigs of figure 8 and orthologous sequences in human.

30

Figure 10: DNA sequence polymorphisms in the IGF2 and flanking loci from genomic DNA isolated from Piétrain, Large White and Wild Boar individuals.

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Table 1 Summary of QTL analysis for pig chromosome 2 in a Wild Boar/Large White intercross¹

Trait	F ratio ²	Imprinting	Map position ³	Percent of F ₂ variance ⁴	Least squares means ⁵		
<i>L</i> ^P / <i>L</i> ^M	<i>QTL</i>				<i>WP</i> / <i>WM</i>	<i>WP</i> / <i>LM</i>	<i>L</i> ^P / <i>WM</i>
5					n=62	n=43	n=30
<u>Body composition traits</u>							
	Lean meat in ham, %	24.4***	19.1***	0	30.6	64.2 ^a	67.3 ^b
	Lean meat mass in ham, kg	18.1***	16.8***	1	24.3	4.72 ^a	5.02 ^b
10	Lean meat + bone in back, %	12.2**	9.6**	0	17.4	66.7 ^a	70.8 ^b
	Longissimus muscle area, cm ²	10.3**	4.8*	1	15.4	33.0 ^a	35.2 ^b
<u>Fatness traits</u>							
15	Average back fat depth, mm	7.1*	8.7**	0	10.4	27.7 ^a	24.7 ^b
<u>Weight of internal organs</u>							
	Heart, gram	9.7**	11.4***	0	14.4	225 ^a	244 ^b
20	<u>Meat quality traits</u>						
	Reflectance value, EEL	5.7	6.1*	1	8.1	18.4 ^a	21.8 ^b

P*<0.05; *P*<0.01; ****P*<0.001

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

Table 1, continued

¹Only the traits for which the QTL peak was in the *IGF2*

5 region (0-10 cM) and the test statistic reached the nominal significance threshold of $F=3.9$ are included.

²"QTL" is the test statistic for the presence of a QTL under a genetic model with additive, dominance, and imprinting effects (3 d.f.) while "Imprinting" is the test statistic for
10 the presence of an imprinting effect (1 d.f.), both obtained at the position of the QTL peak. Genome-wide significance thresholds, estimated by permutation, were used for the QTL test while nominal significance thresholds were used for the Imprinting test.

15 ³In cM from the distal end of 2p; *IGF2* is located at 0.3 cM.

⁴The reduction in the residual variance of the F_2 population effected by inclusion of an imprinted QTL at the given position.

⁵Means and standard errors estimated at the *IGF2* locus by
20 classifying the genotypes according to the population and parent of origin of each allele. *W* and *L* represent alleles derived from the Wild Boar and Large White founders, respectively; superscript *P* and *M* represent a paternal and maternal origin, respectively. Figures with different letters
25 (superscript a or b) are significantly different at least at the 5% level, most of them are different at the 1% or 0.1% level.

Table 2 Maximum likelihood phenotypic means for the different F2 genotypes estimated under (i) a model of a mendelian QTL, and (ii) a model assuming an imprinted QTL.

Traits	Mendelian QTL				Imprinted QTL		
	$\mu_{LW/LW}$	$\mu_{LW/P}$	$\mu_{P/P}$	R	$\mu_{PAT/LW}$	$\mu_{PAT/P}$	R
BFT (cm)	2.98	2.84	2.64	0.27	2.94	2.70	0.27
% ham	21.10	21.56	22.15	0.83	21.23	21.95	0.83
% loin	24.96	25.53	26.46	0.91	25.12	26.14	0.93
% lean cuts	65.02	65.96	67.60	1.65	65.23	67.05	1.67
% backfat	6.56	6.02	5.33	0.85	6.43	5.56	0.85
% fat cuts	28.92	27.68	26.66	1.46	28.54	26.99	1.49

CLAIMS

1. A method for selecting a domestic animal for having desired genotypic properties comprising testing said animal for the presence of a parentally imprinted quantitative trait locus (QTL).
- 5 2. A method according to claim 1 further comprising testing a nucleic acid sample from said animal for the presence of a parentally imprinted quantitative trait locus (QTL).
3. A method according to claim 1 or 2 wherein in the pig said QTL is located at chromosome 2.
- 10 4. A method according to claim 2 or 3 wherein said QTL is mapping at around position 2p1.7.
5. A method according to claim 1 to 4 wherein said QTL is related to the potential muscle mass and/or fat deposition of said animal.
- 15 6. A method according to claim 5 wherein said QTL comprises at least a part of an insulin-like growth factor-2 (IGF2) gene.
7. A method according to anyone of claims 1 to 6 wherein in the pig said QTL comprises a marker characterised as nt241(G-
- 20 A) or as Swc9, as identified in figure 4.
8. A method according to anyone of claims 1-7 wherein a paternal allele of said QTL is predominantly expressed in said animal.
9. A method according to anyone of claims 1-7 wherein a
- 25 maternal allele of said QTL is predominantly expressed in said animal.
10. An isolated and/or recombinant nucleic acid comprising a parentally imprinted quantitative trait locus (QTL) or functional fragment derived thereof.
- 30 11. An isolated and/or recombinant nucleic acid comprising a synthetic parentally imprinted quantitative trait locus (QTL)

derived from at least one chromosome or functional fragment derived thereof.

12. A nucleic acid according to claim 10 or 11 at least partly derived from a *Sus scrofa* chromosome.

5 13. A nucleic acid according to claim 12 wherein said nucleic acid is at least partly derived from a *Sus scrofa* chromosome 2, preferably from a region mapping at around position 2p1.7.

14. A nucleic acid according to any one of claims 10 to 13 wherein said QTL is related to the potential muscle mass
10 and/or fat deposition of said animal.

15. A nucleic acid according to any one of claims 10 to 14 wherein said QTL comprises at least a part of a insulin-like growth factor-2 (IGF2) gene.

16. A nucleic acid according to anyone of claims 10 to 15
15 wherein a paternal allele of said QTL is capable of being predominantly expressed.

17. A nucleic acid according to anyone of claims 10 to 16 wherein a maternal allele of said QTL is capable of being predominantly expressed.

20 18. Use of a nucleic acid or fragment derived thereof according to claim 10 in a method according to anyone of claims 1-9.

19. Use according to claim 18 to select a breeding animal or animal destined for slaughter for having desired genotypic or
25 potential phenotypic properties.

20. Use according to claim 19 wherein said properties are related to muscle mass and/or fat deposition.

21. An animal such as pig selected by a use according to claim 18 to 20.

30 22. A animal according to claim 21 characterised in being homozygous for an allele at a paternally imprinted QTL, preferably located at a *Sus scrofa* chromosome 2 mapping at around position 2p1.7.

23. An animal according to claim 21 or 22 wherein said QTL is
35 related to the potential muscle mass and/or fat deposition of

said pig and/or wherein said QTL comprises at least a part of a insulin-like growth factor-2 (IGF2) allele.

24. A transgenic animal comprising a nucleic acid according to anyone of claims 11 to 16.

5 25. An animal according to anyone of claims 21-24 which is a male.

26. Sperm or an embryo derived from an animal according to anyone of claims 21-25.

27. Use of a sperm or an embryo according to claim 26 in
10 breeding animals destined for slaughter.

FIGURE 1

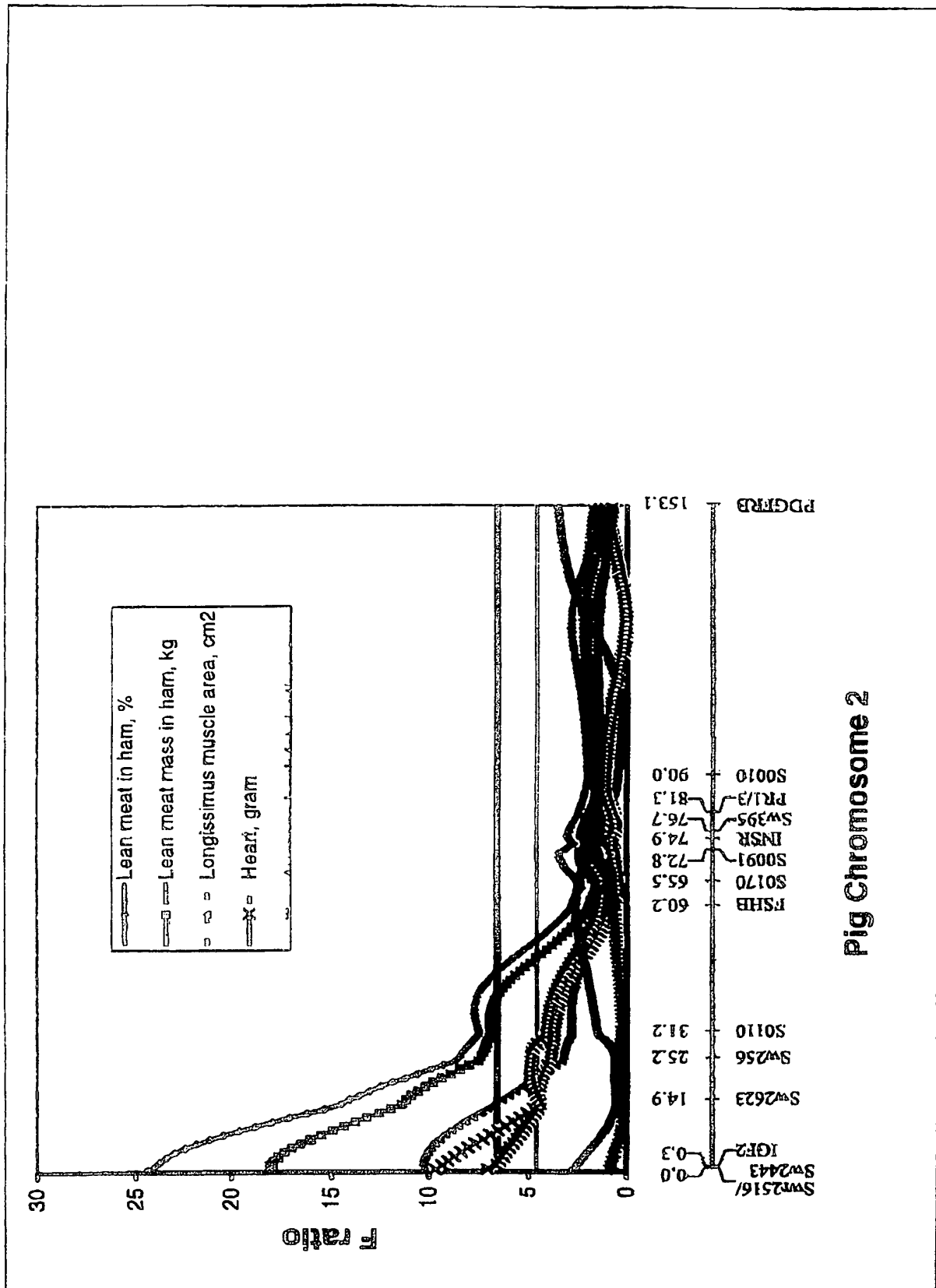


FIGURE 2



FIGURE 3A

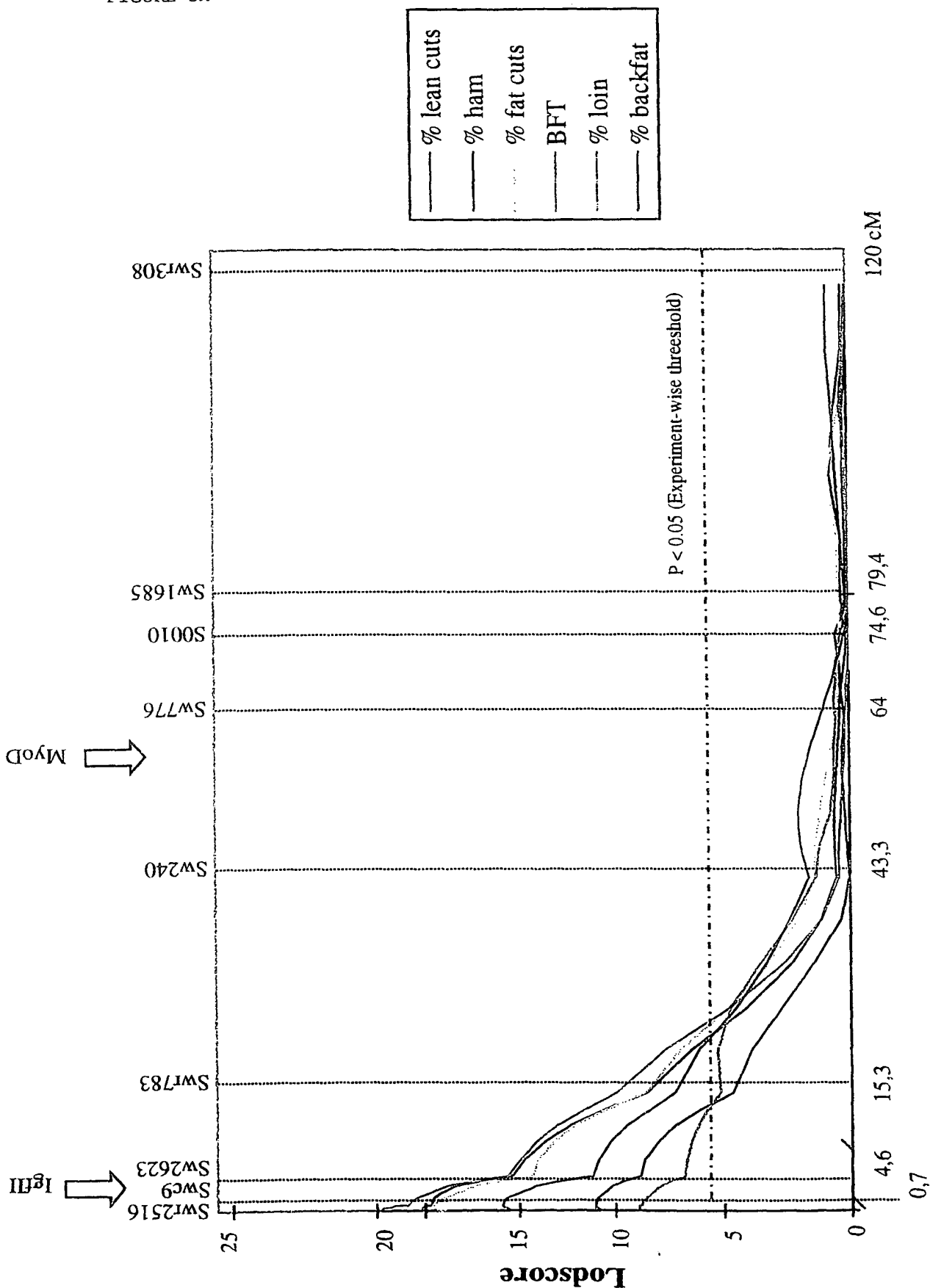


FIGURE 3B

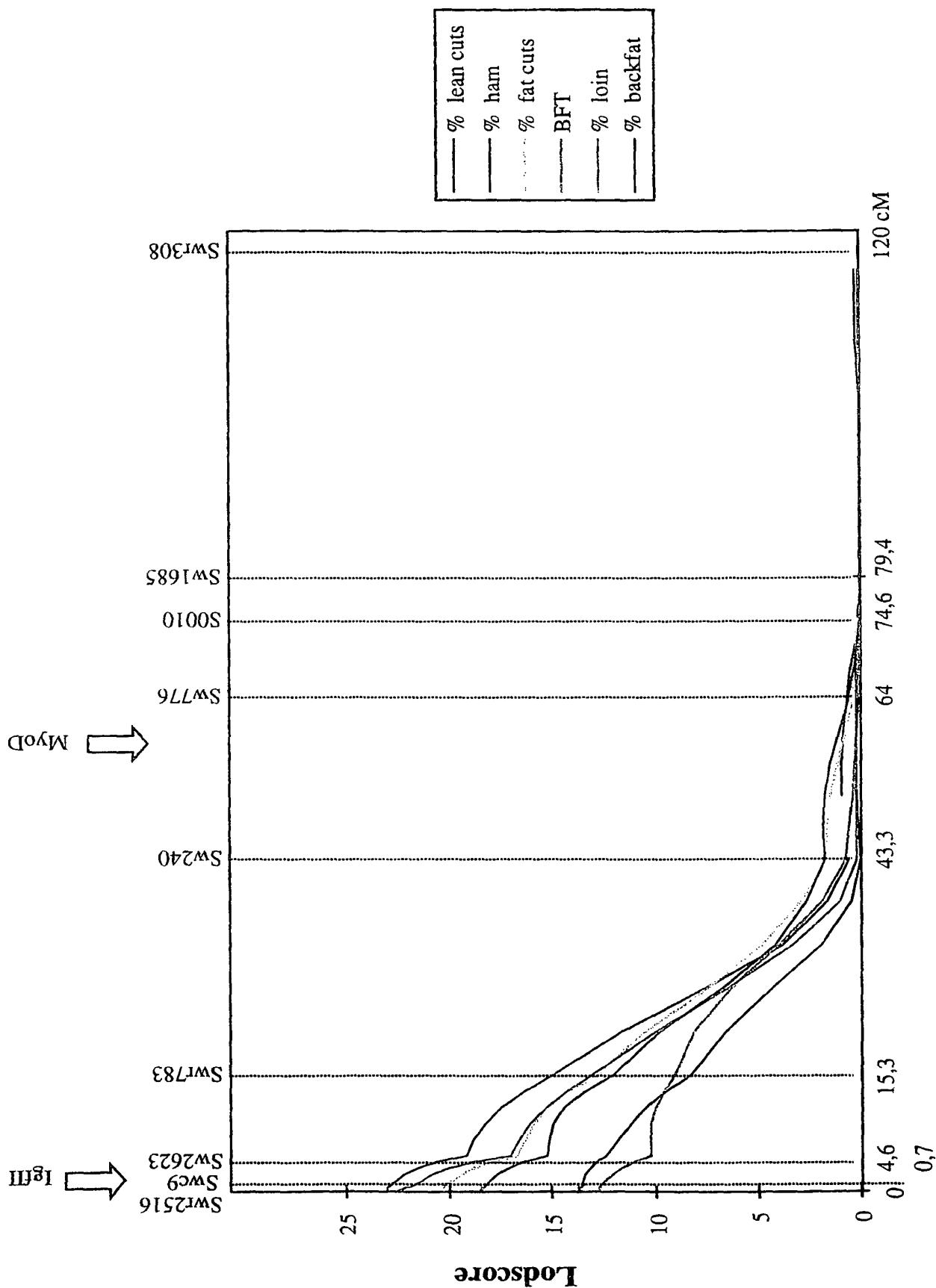


FIGURE 3C

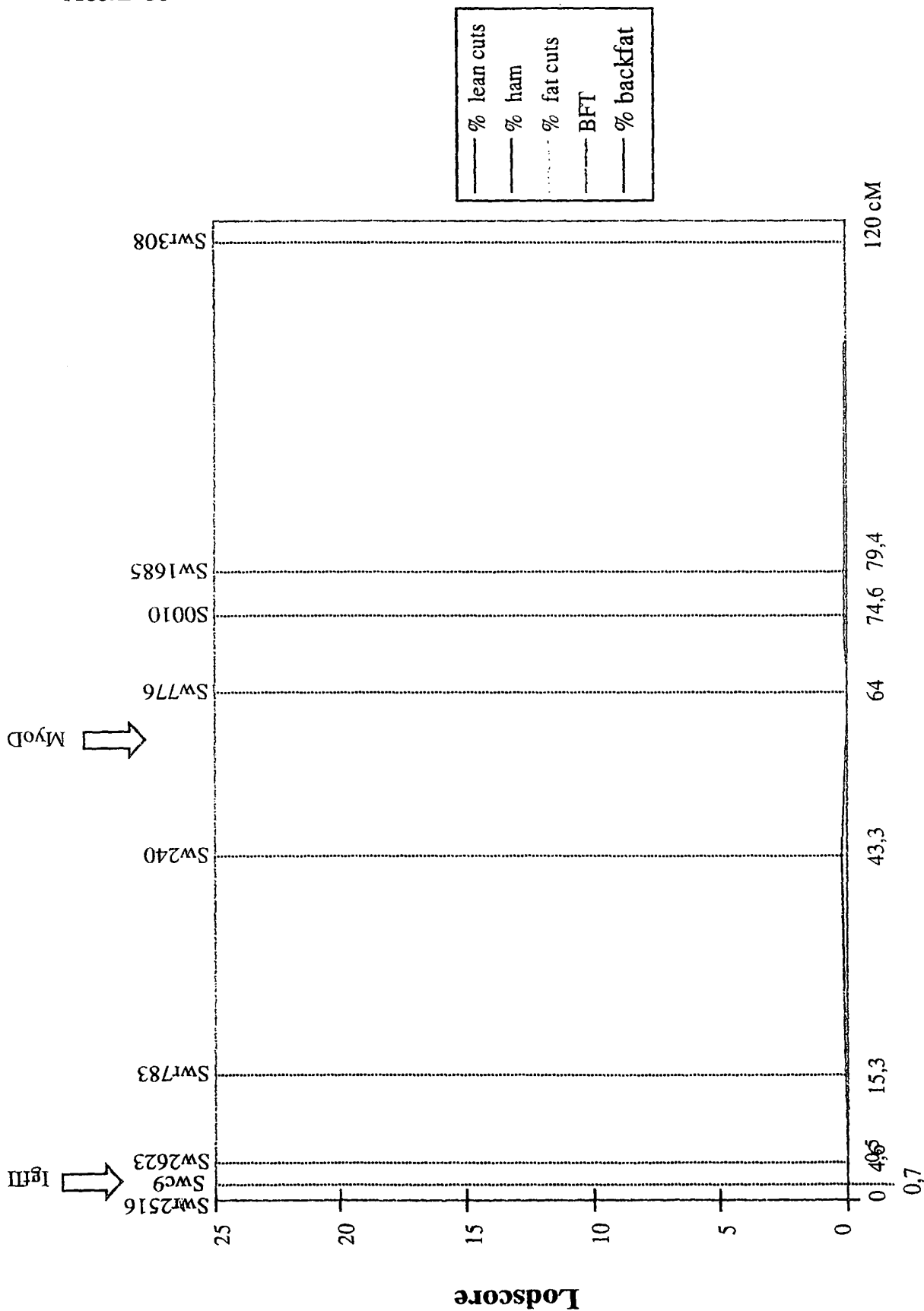


FIGURE 4

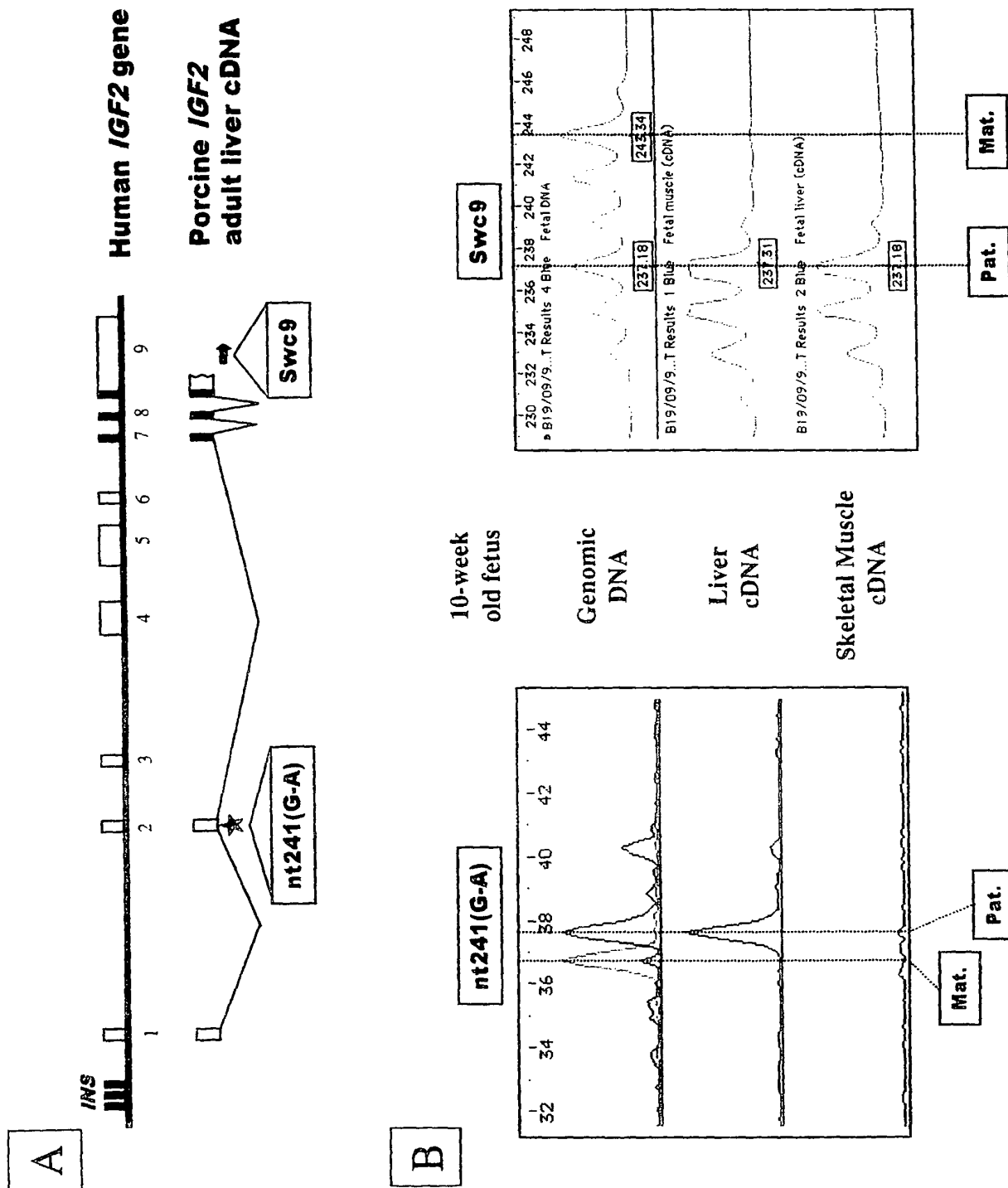


FIGURE 5

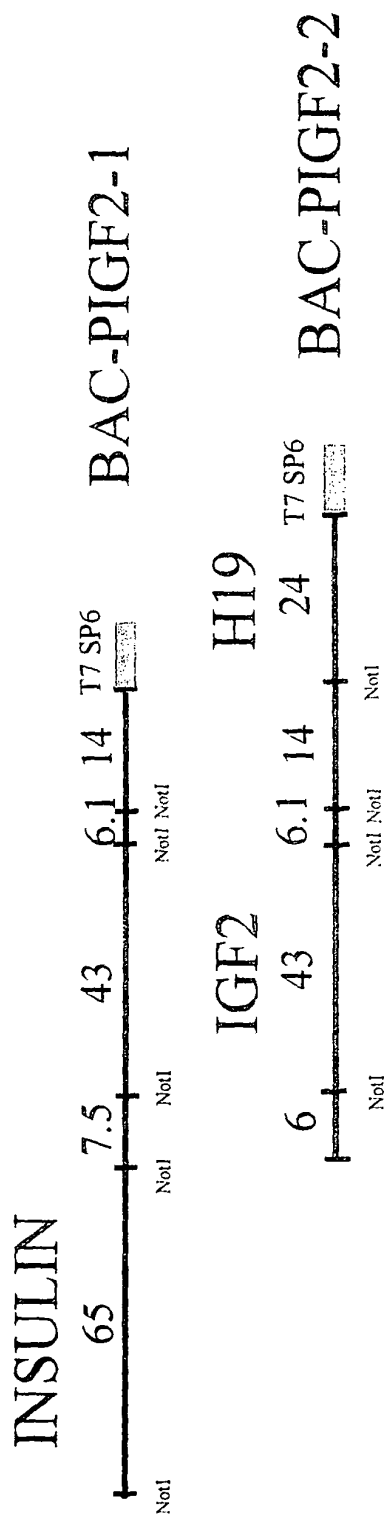


FIGURE 6

Contig 1 (500 bp)

GGGTGGGCAGCTTCCTCCAGACCCGAGGAGGCCAAGTTCCTGGCCCTGCCACCCAGGGCCAGCTGAAGC
AGGTCAGAGACACCCGCTCCTGTCCCTCCTGTACCTAACCCAACAGGCCGGGGCCAGGGACACAGGCCACA
TGGCATCTCCCCCATGCCCCGCCCCAAGGCCGCCAGCAGGTGAGGCTGGAGCAGAGTCTGGGTCTGCGGG
CCAGACCGAGGGCAGGACAGCTGGGCATCTGTCTCACAGTCCCCGCGCTTTGTCTGGGAGGCGGCAGAGCCTC
ATCCAAGACGCCCCGAAGGAACGGGAGAAGGCGGAGGCCGCGGCTGCCGCGTCCGAGCCCGGGGAGGCCCTGG
AAGTGGGGGGCCCTTGCCGAGCGGGACGGGAAGGCCCTGCTGAACCTGCTCTTCACCTTGAGGGCCACCAAGCC
CCCCTCGCTGTTCGGTCCCTGAAAAAATTCTAGGTGAGGGGGCGGGCCAGGGCTCCCCGGG

Contig 2 (943 bp)

TGCTCTCACACCCCGGGCGGGGCTGCTCTTGGGGCCATCCTCCCCATGGGCCAGCACCCACTCTGGCCTTC
ACACCTGCCGTCTTCTGGGAAGTCCCTCTGGTTCCCAAGGAAAGTTTCTGAGCTGGACAAGTGCACACCTGG
TCACCAAGTTTCGATCCTGAGCTGGACCTGGACCACCCGGTGAGCCGGTGCCTCCCCCGCCGCCATGTC
TCCCATCCCCAGGGGTGTCCCCACACTCAGGGCCGGGACTGGGCGTGAACCCCGGGTTGGGACGGATGTTGGC
CTGCTGTGTGGCTCCTGGCGGAACAGAGAGGCTGGCTGGGTGCCACCCCGAGGGCCCCCGCCGATGACACGG
GCCGCGTCTGGGCTGGGCGGGCAGGGCGGGCCAGGC
AGGCGAGCCTCCGATGGCGTCCCCGGCTGTCAACAGGGCTTCTCGGACCAGTTGTACCGCCAGCGCAGGAAGC
TGATTGCCCCAGATCGCCTTCCAGTACAGGCAGTAAGTCCCTCCAGGGCCTCAGCCTGGGGGCCAGACCTCAG
CCTGGGCCCTCACGCCAGACCTGGGGGTGGAGGGAAGGGAGGTTGTCTTTGTACCAACGCCACCACCTTCACT
GTCACCATGGTCACCGACTCTGGGTCCCCAAATCACAGCTGAGGAACTGGGGCACAGAGTGGTTAAGCATCT
TGCTGAAGCCACACAGCTGGCGGAGCATTTGGCCCCGGCCCCCTCCTGCGGCTCCACACGTGCTCCCTGAGGG
GCCCCGGACTGACAGCTGTCCCCCTCCTCAGAGGTG
ACCTTATCCCCCGCTGGAGTACACAGCCGAGGAGATTGCCACCTGGTGAGGCCCTGTGACAGCGGCTGGGAG
GGCGGGAGTGGGGGAAGGGACAGGAAGACCTCAGAATTCCCGCGTGGAACGTGGTGGCCTCTATCATGA

Contig 3 (1500 bp)

GGGGAGGGGATGCTCAGACCCGCTCTGGGAAGAAGAGAGCCTCAGAAGAAATCCCTTCCCAAGGGTCACGCGG
TGGAGCCAGGGGCCCCGCTAGGGGCGGATTCCACAGCTCGTGCTGCCACCTGCTGGCGCTCCAGGAACCTGC
GGAGGCGGTGGGGGCCCTGGATGGGTCCGGCAGTGGGCTCGCAGGAGACCCCTGGAGGGGCTGCGGACACCCC
AGCTGGCACTACAAGGTGCCAAGCGCGGTGGCAATGGGCTGAGCCTCTCCCCCTCCTCTCCGACAGGA
CATTTGGCCTCGCATCCCTGGGGGTCTCGGACGAGGAAATTGAGAAGCTGTCCACGGTGGGTTTCTCCCCCTGC
AGGGCCCTGGGTTCCAGCCAGGCCCTCCTGTCAA
GGGGTGTCTGCTCCTCAGCTGTGACCGCCCGGGAGCCTGGATCGGTTCTGCCTGGGTGGGCGGTGCCCGGGCCA
CGGGCAGCAGGGGAGCGGTGCGGGCCCCAGCCGTGTCTGAGCCCCCTTGCCGCTGTCCCCACAGCTGTAC
TGGTTACGGTGAGTTTGGGCTCTGCAACAGAACGGCGAGGTGAAGGCCTACGGGGCTGGGCTGCTGTCTCT
CCTACGGGGAGCTCCTGTGTAGGCCCTCCCCACGCGCTGGGGCCTGGGTCCCCGGGGAGGTGACCCCTGCGG
TGCTTGTGGATTCCAGCTCTCGGAGGCTGGAGGCGGTGCCCTCCTGGGGGCACCAAGAAAGCTGGTC
TGCGCCCCCTCCACACACCTGTGCTGGGCCCTG
GGGGGACCCCTGCTGGGGGATGTGGGTGCACAGCCAGGGCCACCAGGGAGTCAGGACACGGGGCTCCCTTCCC
TCGGGTCCCTGAGACCCCTGGCCTCCCGCCAGCACTCCCTGTCCGAGGAGCCGAGATCCGGGGCTTCGACCC
CGACGCGGCGGCGGTGCAGCCCTACCAGGACCAGACCTACCAGCCCGTCTACTTCGTGTCTGAGAGTTTCAGT
GACGCCAAGGACAAGCTCAGGTGGGCCGGGGCCCCGGGGCCCCAAACTGGAGGATCCAGCCGACGCCCCGCC
TATGAGCCCATTTCCAGCAGAGGGAGCTGCTCGGACCCACCGTCAACACCCCTTCCCAAGCTGGAACC
CCAGAAAGCCTGCGGAGGGGGGACCTGCAGGGCTG
TGGCCAGGTCAAGGCTCAGTTCGAGGCCAGGCTTTTAGGGGTGAAGTCTGACTTTGTAAGAGGGGTGCAGGGT
CCTTCCCAGCCTCCTCCCTCCGAGCAGCTGGGGGCGGGGCGGGGTGCGATGAAGGCAGAGATGACGCAGCC
ACCCGTTACCCCTCAGGAGGCGCCTCCTGTCCAGCCAGGCTCCTGTTGTACAGGGGAACTGAGGCCCCAGG
TGTGTGTGTGGGGGTGATTCTCACACACAAGCTTAGGGACAGGGACATAACGGCCTCTCCAGGGCACACAG
TCTGGAGG

Contig 4 (3024 bp)

TTAANTCCANGTTGGCCCGACAAGTTTTCCCCATTTGAAAAGGGGCCAGTTAAGCCCCAACNCAATTAATTGG
AAGTTAGCTCCCCCTATTAGGCTCCCCAGNCTTTACNCTTTATGTTCCGGTTCGTATTTTTGTGGGAATTGTA
GCGGATACAAATTTCTCAAGNAACCAGCTATGCCATGATTACGCGGTACAGTAGTTTCATCAGTCCCCCCCC
CCCATGGGACAGCGAAGGGAACCAAGTATGTCTGGGGCGGGTCTAAAGGGGTACCAACAGGGAGGGGACAGG
GGCTCCAGGAGGACAGGGCCACTGAGCGGTACCTGGTGGGGGGAGGTGGTGGGGCCACACCCAGGAGTCTGTG
CCCCCCCCACTCCCGCGTGGACATGAGAAGCAGGGGCCAGCCTGCGGGTCCCTGAGTTACGCCCCCCCCC
CCCCACCGCCGACAGCCCGGGGTCTCAGCAGGCTGCTGTGCTGGGGGCGGGGGCGCTTATGGRGCCGGGAG
CAGCCCCCCCCACGGCTTCAGAGCATCTCTGGGGCCTCAGGGATGGACCGGGTCTGCRGGCAGGTGTCTCT
TCGCGCCCCCACTCCCTGGGCTATAACGTGGAAGATGCGGGCCCAAGCCCCGKCGGTTTGGCCCTTTGTCCCCAG
CCAGTGGGGACAGCCTGGCCCTCAGGCCGCTCGTTAAGACTCTAATGACCTCAAGGCCCCAGAGGCGCTGAT
GACCCACGGAGATGATCCCGCAGGCTGGCAGCAGGGAAATGATCCAGAAAGTGCACCTCAGCCCCAGCCA

FIGURE 6, CONTD.

TCTGCCACCCACCTGGAGGCCCTCAGGGGCCGGGCGCCGGGGGGCAGGCGCTATAAAGCCGGCCGGGGCCAGC
CGCCCCAGCCCTCTGGGACCAGCTGTGTTCCAGGCCACCGGCAAGCAGGTCTGTCCCCCTGGGCTCCCGTC
AGCTGGGTCTGGGCTGTCTGTCTGGGGCCAGGGCATCTCGGCAGGAGGACGTGGGCTCCTCTCTCGGAGCCCT
TGGGGGGTGAGGCTGGTGGGGGCTGCAGGTGCCCTGGCTGGCCTCAACGCCGCCCGTCCCCAGGTCTCTCAC
CCCCGCCATGGCCCTGTGGACGCGCCTCCTGCCCTGTGGCCCTGTGGCSCTCTGGGGCGCCCGCCCCGGC
CCAGGCCTTCGTGAACCAGCACCTGTGCGGCTCCACCTGGTGGAGGCGCTGTACCTGGTGTGCGGGGAGCGC
GGCTTCTTCTACACGCCCAAGGCCCGTGGGAGGCGGAGAACCCTCAGGGTGAGCCGAGGGGGYGTCCCGGA
GCGGTGAGGGGAGTTTTTAAGGAGGAATTGGTAAAGTGACCAACTCCTGGGAGCTGAGCCAGAGACACC
CCTCCACGCCCCYGGTCCCGCTCGAGAAGCCCCCTTCCCTCCCCCTCCTCCCG
AGGCGGCTCCAGGGAGGAATCTTACGGAGTCAAGGCCGGGTGCCGCTGGTCTCCGAGTGACATGGCCGTGGT
GTCCRTCTGCCGCCCCACATGCCCGTGAGAGAWGCCCATCCCCCTGGGAGGGGGCCCCGTGCCGGGACGGC
GGCGGAGGCCAGGACCGGTGGCTGTGCGGCTTCCACTCCAGGGTGGGCGGGGTGGGGGGTGGCTGTCTCT
GTGTGACCGGCTCTCCCCGACGAGGTGCCGTGGAGCTGGGCGGAGGCTGGGCGGCTGCAGGCCCTGGCGC
TGGAGGGGCCCCGAGAGCGTGGCATCGTGGAGCATGTCTGCACAGCATCTGTTTCCCTCTACAGCTGGA
GAACCTACTGCAACTAGGCCGCCCTGAGGGCGCTGTCTGCCCGCACCCCAAAACCAATAAAGTCTGAA
TGAGCCCGGCCGAGTCTGTGGTCTGTGTGGCTGGGGCGGGGGCCCTGGTGGGGAGGGGGCCAGAAGGCTGT
GGGGGGCTGCTGCGACCCCTCTCTGCTCTCGCCACATCGGCTGCTCTAAGCTTCTCCACATGCATCGGGT
GCCACAGGCACATGGGCACCGGGGGACAGGGCCAGGGCAGGGCCCTTCAATGTGGCGAGCTCTGGTTTTT
AGGGCTCCAGACACCCCTCCTGGGTGCCACTGCTGCACAGGGTCACTCTGAGGGTCACAGGGCACCCACCC
AGACTGCTCTTGGGCACACAAATAGCCAGGGGCTTCTTGGGCTGGCTGCRGTCTGGGAGGTGAGAGGTGA
CCCCGCGGACCAAGACTGGCCAGCCTGCCAGTCCGACGGCCAAACCAATCTGCACCTTTGTCTGAAGGTTT
CACCCGGGCCAGCACTGGGGGCGGCGGGGCTAGAGCTGGGCGCCCGGGCCAGGGACTGCACACCCGCCAG
AGGTGGGCTGAGGGGTGGCAGCAGGCTCTCCGCTGGGACCCAGCCAGCTGGGCAGCTCACCTCTCAACACG
AGGCTCTACCTGTGTCTGCTCCCTCCCCACGGCCACACAGACACCCCTGGGGAGAAGTCACAGGCCCCAGCA
GGCCCCGCCCCCTGGAGAGGAGGCCAGGGCTGGGACGGGGTGGCCGGCCGGACACTGGACCCGGAAGGGGG
TAGCGGCTGGGATGAGTGGCGAGCTGTCCATGGGAGCACCCAGCGGCCCATTTGGCAGCAGTACAGGAGGG
GCACCTGCAGCAGCTGAGGTACGTGGGTCCCCGACTGGTGGTGTCCGGCTGCCCTCTGGGAGGCAGCGGG
CTGAGCTTGTGGTCTGCCAACCAGGGAGACCCGTGACCACCTGCTGCTTCCCTCCCCCCCCAGGGCCAGCA
GACTCCTTTGGGACTCGGGGGCCCTGAGCCGCCCCACTCGCAGGACTCACGGGTGTGCGGTCTGGGTGAG
TGGGGGCTTGGGAGAGGGTCACTCTTGTCCGTGGGTGGGGAAGGCTGAGAGTCATGGTGTGACAGCGCCCTC
GGCTGCCGGGTGGGGGCTCCTCTTCTCCCGAGCCAGATCCCCGGGTAC

Contig 5 (1730 bp)

CGTCACCCGAGAACGCCAGGCCACAGGCCCTTGGCTCAGCCCTCCACCCAGGCCACGTTCCGCCCTTCTG
GGAAGTGGAGGACAGCCCCGCTCGCCCTCGGACCTGGCTTCTGTTGCCCTGGCATCTGGCAGTGGCCGGCAG
CTGCGTTACGCCCTGGATGACACCCTGGCGTGAGCGGTGGGTCCCCGTGCTGAGGGGAGCCCCACACACGTC
CTGCTCACTTGCCTTGTGTCTGCTCCGCATCCCGTATCACACATGCCATGCTGGGGCACCCTAGCGCCTTGC
CCTGTGTGGCACTGTGGCACTGTGTTCTGTAGTGGGAAGACTGAGGCTGGGGTACGGCCCGCTGCTGCCACCC
TCTAAGGACATTCTGCCGGTGACAGTGCCTCCAGG
CTGGCCCCCGGATTGCATCTGCTTCTGGCACGGATGAAGTGGCACCTCTGCCTGACCATTAGGGCTGTATT
GCCTTCTCCTGTTGGCAGTAAATATTTACTGTCCCTCCCTGTTCTCCAGGGCCGANCCAGTTCTGAGGGGC
ATGGGAGGTGGACACAAAGGTGCCAAGCAGCCCCCTGCTCTTGGAGGGCCAGTGTCTGGTGGGGGCCAGCCT
GGGAAGGAGGAGCGAGACTAGGAACCAGAGGCTGTGTTCTTGGAAAAGGCCCCCTGGCAGAGTTCGGGTGG
TGTGTCTCCAGCTAGGCTGTGAGTCTTCAAACCTGGGGAGCCCGGCCCTGGACCCAGGCAGGGCTGCACCCCT
GGTGCCAGTGCTTCACTGGGTGGGCACCTGTCCCC
ACCAGGCAAGGTGGTCCGAGCGGTCAATCACAGACAGAACCCAGCAGAGGGCGCCAAAGCCCCACTTTTGACAA
ACTCCCTTCCGCCCTGAGCCGAAAGTCCAGGCGGCAGGTGGACCTCTCTGCAGGGCTCTGCCACCCCTGCTGC
CGCTTGCCAGCACTCACAGGGGCTGCGGGGGGTGCCAACAGGCCGGCTACCCCTGAGCTCTGGAGGCGATGGA
GTTTAGGAGGGAACGAGGGGACTCCTGGGGGTGACTTCTTTCAGCGCCACATTGCGGCCAGCAAACCCGAGG
CTGGAGGAGGCCGGGCACCTGTGCCAGCTGGAGCCTTGTCTGAGGGTCTCCAAGGCTGGGGAAATTGAGGC
TGGGGGCTGGGGGGTGTACTGTGCGGCCAGGAGG
CCCCTCGCTCTGATTGGAGCCGCTCGGCCACTTGAAGCAGGAGGCTCACATGAGGCGGGGGCTGCAGGGACA
GGACCCCTCGGGGGCCCGGAGGCCTTGGAGGGGGTCCAGCTGGGCCAGGGTTCGTTCTTTCCCGGGTCCATGTC
CACCGCCCTCCCGCTGCTGGGAGGAGAGGAGGTCCAGGGCAGAAAGATGCGTGGGGATGGGGGGGTGGTCAG
GGGTCTGGAGCTGTGGAAACAACAACAGACAGCGAGGTCTTGGGGCGCCCGGCCCGCCCTCCGGCA
CTGTTGTTTCTGGCCGGGGTGCAGGGACAGCGAGGCAGATTCTTTCGAAAGTGAGACTGGCGGGGGGCCCT
CGGGTCTCAGCTACCCCTGAGCTAGCCCGCC
ACTCGGTCCAACCTCCCGCAGGCCCTGGCACGGTCTCCAGGAGTCCACTGAGGGGTCCCCAAAGCTGCCAC
CAGGAGCTGGGCTGGGTCTGTACCACCCACCCACCCCTCCAAGTCTGAGATATG

Contig 6 (4833 bp)

ATGTGAGCTGCACAGCATGAGCCCTCGGCCCACTGCTGTGGCCTTGGCGACATTGAGGTGTGTGCCGCCAG
GGCGACCACACCCCTGGCCTCTCAGGGTGCCCGTACAGAGGCGGCTGGGTCTGANGAGGTGCGGGGCTCTGGGG
ACCGCTGGTGTGAGTTAGGACGGGGGTGATGCCACCTCCTCTCTGAAGGTTGGTGAGGTGGCCCTTCTCTTAT
CGTGATGACAATACTGATTTCTGGAAGAGCCAGGTGTTTCTGAGGCTGTGGTTGCACTTCTCCACGTGGCCA
CAAGGTGCCGGGCTCGGGTCAAGTTTGAGAAGCCCTGCGGGAGCGGGTGTATGCGCCAGATTACAGTTGCCT

FIGURE 6, CONTD.

CCTGCGGGTCTGGGGTCAGGACGTGGTCCCCAGCAGTCTGCTCCAGAGCCTGTCAGTGATGTGTGGGATTTTA
CCGCTAGAACACAGTTTCCCTCTGATTCTCAGAAACCAGCAGATGCTTTAGGAGGGGCGTGCAGGTTTACCTTG
TGCTGCANNGCCCCCTGCCACCTGGTTCGAGCCNCAAGACGGCATCTAAAGATCAGTTCCCTCATCATCAGTTC
CGCAGTGCTGGGGTGGGGGCAGATGAGAACCCTCAGGGCTGGGCGCAGAGGTGGGGAGCCCCGCTTGACCCCCGA
CACTGCAGGGGGGCTCCCCCTTGTAGGAAGAACAATGTCGCTTTGCCACCCAGCCCTCTCCCCAGGGTGCCC
CGAACTGTTGCTCCTAAGACCTCTGGGCTGTGTGCTGTAATTCCTATAAGTGGCCACCAGGTGTCAGCAGGAGG
CCACTTAAGCATCCATGTGGCGGAAACCTGGAGCTGGGGGTTCCTAAGGGTCCCTCGAGTGCTCCTGAATAA
ATAGGCGCTGACCTGATCCCCAGGAAGGATAACCCCTCTCCCAGGCCCTAAGAGGCAGTGGGGCAATGAGGTTT
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TAGGGGGGCACAGGCCCTGAACACTTGAAGCTGCAGAGCCAGAGCAGAGCCAGCAGGAGCAAGTGACTGCTC
TGGTCCCCCTTGGGTCCCTCCCCACCCGACCCGCTCCTCTGCTCCCCCTCCCTTTGCTTAAATGCTCTGCGTTTC
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CGGGTTGCCCATGGAACCACATCATCTGGCGTGGGGTGAGCCCTTATCCTCCCTGGCCCCACTGGGAGGGTT
TGGGGAAGTCCAGCTAAATTTCTCCGTAGGGACCTGGAAGGAGCCCTTGTGACATCTGGGCACAGATAAGAG
GTAGGGGGGCACAGGCCCTGAACACTTGAAGCTGCAGAGCCAGAGCAGAGCCAGCAGGAGCAAGTGACTGCTC
CCCACCCCAAGAACGTGTGGGTGCGTCACACACTCCCCACTGTGTGCCCTGGACCTGACAGGGGCTTTAGCCT
CCCTGCATCCCTCCCCACCAAGAACCAGTGAGGCACCCACTTGGCCCTCCTTAGTGTTGTTATGGCTCTG
GGGCACTGTGATTTTGTGTTAGGACACCCCAAGCTAGATTTAAGTCCCCCAAGTGTGACTCTTTCCCTCCACTG
AAAACCCGTCTCTCCACCAAAAGGGCCCTATCCCTTTAGCTGAGCCAAGGAAATTCAGGAGGGGCTTGAATG
ACAAAGGAAGAGGGGGAGAGTTAAACCCCAACTGGCTGGCAAGCTGGGTGGGGTGACACCCCAAGGTGCA
GGGTGACCTGAAGGTAGCGGCTGGTGGCCCTTCTGGAACTACATGTGACTTTGCCATTAGGTGAGTCTTTGC
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GCTTGTATCTGGGCCCTTCCCCAGCTGCTGACCACCTCTGAGTCTGCGCCTTAGTTGGAGTTTGGCCAAGCTC
AAGAGGCTGTGGACCCCAAGTCACTCCACCCAGGGGTGCCCTGTGGGCAGGACGCTGCTGCCCTGCCATTTGCTGC
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CTCCAGGTGAGTCCCTGCCCTCTGGAAGCAAGATGGACATGACCGCACTGTGTTGCAGCTGCATTTGGGAGGC
CCCGAAGAAAGATTTTCTGATCTTTCTCGAACCCCTGCTTTTCCCCATCATGCCCGGCCCCCATTTTACCCGT
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CAGTTGCCCCAGCAGCCCCAGAACCCTAAGTTGGCACAAGCTACCCAAATTTGGAGGGGCTTGGGGAAGGG
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CAGCTTTGTCCCCCTCCTCCTCCTCAGCGGCAACCCGGCTGGAGGGTCTGGCCACTACAGCCAGAGCGCCCC
TACTTTGTGTGGGCTGCTACTATTGGCCCAACCAGCGGATCACCGGCCAGGCAGTTTCGGCAGAGAGTCTGG
GGCACCAGTGACTCCCCCGTCTCTTTATCCACCCACCCAGGAGCTTACAGGACTACACAGCGACTAGAGGGCA
GGTAACGTGCTGCCCTCCTTAGGGCTGCCCTCAGAGTGCTGAGAAAAGCTGCATTTAGTTTGGGTG
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CCGGAGCCACAGAGGCTTTTGCAAGGAAAAATAGGTTTCCCTCACTAATGCAGCAGGCAAAATGGGAGGGGCA
GGGGTGGAGGGTAGTGCCCCCGCCCCAGCAGGAGGGGACAGCTGTTTCTGCAATGTAAAAAAGCAGGGTTT
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GGGGCAGAGCCCCGAGATTTTGGAGTTGTTTATATATGATATATACCATTTTGAAGCAAAAGCTTCCCTCT
CCCCACTCTCCCTACATGTCCCCCTTACCAAAAAATCCACCCACGTAACCTGGAAGGGGAGTGAGAAGGACGA
CGAAGGGGCACGTGCCCTCCCGTCCCACAGCGGGACTTAAAACGTACAGCTTTTCGCCCTCCGGACAGTGTC
CGCCCCCTGGCCCCCGTACGCTCCCCGTGCCCGGGGGGCTGAGTGTGGGGCCAGGGCTGTCTCCAGGCATGC
ATTATTTTGTGCATGAAGGTTTGTGCCCGCCACCCAGGCTGGTGTGGGGGGAAGGGTTTCAATTGCTCCAAA
GAAGCCCATCTCCCCCTCAGCCACCTTCAGCCGCCCTTCGCAAGGCAGAGCTGTGCTCTGCTGTGTGCCCTG
GCCCCCTCCTTGTCTTATTCAAGGTGGAAGTGTGGGGGGAGGAGAAGAGTTTATATTTGTGTCTGTGATC
CCCCGAGGCAGGGCATTTGTGTGCGGCCCCCAGCCCCCAGGCCAGGCAGATGGGCCAGCCTGCCCGACAGA
AGGGTCTCCTGCTGCTTGGCTGCAGGGAACCCAGCTCTGGGTGAACCGTGGGCACCTTCCCTTCCCTCCATGCC
CTGTATTTAAAGAAGGAGAGCTGGGGGGCCAGAGGCACAGGGAGGGGAGCCACGGCCCCAGGTCTGACAAGAT
GACCTGCGGGTCTTCCACCCAGAGTCGGGGTGGGGGGCGGATTTGTTTGAAGAGAAACAAATAGGAAC
ACACTCTTTTCTCCCGAGGGGCGAAGAGTCAACCTGAACTTGAGGACGAGCAGCCGATTCAGCCCCCC
AGCCCCAGGGCCCCACATCTCCTCGGGCTCAGCCGCGCGCCCCAGCTGCCCCCCAGCCTGAGCTGCAGCAGGC
CAGGGCTGCCCGAGACCCAGCCCCAGGTGAGCTGCTGCAGCCTGTGGGCCAGGAGATCTCCGCGGGCTCAG
AACTGAGGCGGGCAGCCACCCAGCCACAGCGGTGAGTGTCTCCAGACCCAGGGCAGGGCCCCGGTGTCCCC
CGGCACAGAGAGCTGTGCTGCAGGGCCAGACCTCCAGGCCGTTTTAGTTCCCATCTCCCTTGGGGGAGGGG
TGGGGCTCAGAGGGGCTGGGGTGCATCCGCAGAGCTGGGGTGCAGGGCTCCAGGTGCCCTCTCTCCAGGCGGC
TGGCCCGGAGGGGG

Contig 7 (2014 bp)

FIGURE 6, CONTD.

CTGGTTTCGCACTCCTCCGGGGACTGTTGAAGTACCCGAGAGCGCNCGCGGAGCGCCGGGGGCGAGCGGGGGTG
GCCGCCGGGGGTGCTCCCGGGCCCCCGGACCGAGCCAGGGACGAGCCTGCCCGGGCGGCAGCCGGGGCCGCGG
CTTCGCCTAGGCTCACAGCGCGGGAGCGCGTGGGGCGCGGCCGTGCCGGGAGTCCGCCTGCCCTCCTCGGAGG
CGGCCGACCGGGGAGCCTGGGGGACCCGAGCGCCCGGGGAGCAGCGCCCCGACACGCCCCGGGCCGTCTCG
GCTTCTCCTCCTTCCAGCCGGCGCCCGCGCGGCCGGCTTCGGCACCGGGGCGCTCTCAGTGGCAGGAGAAGCG
TGCCTCCCCGCGGGGTGGGGGACCCGAGGAAACC
CGCACCGCCTGGAGCCGCCCGCGCGGCCAGCGCTCGCGTCCCCCGGGGAGGGCGCCACTGCTCCGCGCGCG
CGTCCCCCGACGCCCCGCGCGCTTCCCGGCCCGGCCGGGATCCTAACCTCTCTCTCGGTTCGACGCCCCGCAT
CCCCAGGGCTCCAGGCCCCCGGCGACTTGCCCGCTCCTCCCAATTGCAGACACGACTTTTTCTGGGACCTCCC
AAAGGACAGCCTGGCTCCAGGGTCCCCAGATACATTACCATTTCTCCAGATCACAAGTGGGTTTTCTGGGC
ACTAAGTTCCAGAGACCTCAAAGCACATGAGCCCCCTACTGGCTTTCCAGGTTTCCACTAGTGGCTCGGTCC
CCACCTCACTGGGGATTGTCTCCAGGCTCTTCGC
GGTGTGATCCCACCCATTTCGCGCCAGGTCCCGCAGTGCCAATCCCTCCTCTAGAAAACTTAAACACTGACTC
CTGGTCTCGGGGTGAGGCTGCCCAATGTGCCTGACTCCCCAGAAAGGTATACCACTGTTTTCTGGCATTTGGG
CACCGTTCCCCCAAAACAGTGAAGCTCTTTTCCCGCGTCCCCATAATTTTGACGCCAGGGGCACCCAAAGCT
TAGCGCCCTTGTGCTCCCCACACCGCGAAGCCCTGCTCCCTGGGGTTCACGACAGTTTGGGACTTTATC
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CCCAACTCCAGTACAGGAAGCGATGGCCCCAGGGA
CCCTCGGAGTTGGAACGTGGCTTCTAAGCCTTACCAAAATTGAGGCTTTCGCGCATGGCGCGCTGATGCC
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CAAACCTCACTGAGCAAAATCTTTTGTGGGGGCTGCAAAGATAGGAGGCATTTCTCTCCGGAGCTCTCCAAA
CTCCCTTGCTTATAATCAAGTTCCCTAAACTTAGACAGAGCTTCCAGGCCCCAGAGGCACACAGAGCCATT
ATTGGAGCTGCGTTTAATGATGACAGGGACCATGGGTCTGTCAGTCCCCCAAGTACAAATGCCCGAGGTAT
CCTTGGCTCCAGCCAAGCCCAAGCAAACTCTTGC
ACAGATCCCATATCTTGTATGTCAAGCGCTTTCGCTGTCCAGTAAACAAATAGTCTGAGTGTTTTCTCCAC
CTCATAACATTCGGAATATTAAAAAATTCCTGGGCCCCCGGAGCTGACAGACAAGAAATCCGGGCTTCCTAAA
ATTGAGAACTGATTTCCCAATCCAGGCCAACGCGAGACCCCTCTCCCAATCTGGAGCCCCCTCCGACTGGACAC
ACTGGACTCCTAAGTATTACGCGCTGTCTCCAGGCACCCCAATGCATTCAAAGTGACGCTTTGGTACAGA
AAGGCACTGATTTCTTGGGCTCCAAAGCAGCCCATGCACCCCGAGTCACCCCAAACTTAGTCAGCATTTCCC
GGGTCTCCCTCCGCACTGCAAACTCCCAACTGCGG
ACACCGGTTCTTCAGGACCCACCGCCTAGACGGTCTTAATCCCTTTTCCCCAGACCTAGATT
Contig 8 (371 bp)
AGATTCAAAACTATTTTTCTGGGGCTCCAAATTGAGGTGCTGCCTGCCAGTCCCTCCAAAATAAACTGAGGG
GTTTTTTGTTTGTGTTTTTTTTGTTTGTGTTTTTTTTTACCTTCCACGAAACAAATCCAACTTTTTTGGA
CCATTGATTTATGGGTCCCCTGACTTTATGACCTTGGCCCAAGTCCCCCTAAATGTAGGCCATTTTCCACGG
GCCTCCCAAAATGAAATTGCCAGATCCCGCCGAAAAAATATCCCGGGTCTTGAAATCCAGGTATTACA
GGCTTGGGCTGACACCCCTCCTTGCTACTAACCAGGTTCCTGAAGTTTAGAGATCACTACCTAATGAACAA
ATCCAC
Contig 9 (2415 bp)
CCAAAAGTGGGGCCCTATCTTACTAGGGTTCCCTAAATGCAGACAGCGCCCCGGGAAAAATAGGGGCGTTTTTTT
TCCTGTTTGCCAAAAATAAACTAATTGAAACCAATTTTTAGAAATTAATAATCTAAATGACCTTGATTTTCTGC
GTTCTCCAAATGTACTTTTACAGCCAGGTTCGCCCGAGTTTAGACGGTGTGCTTGAATCTCTAAAGCACC
CTGAGGATTTTTCCCGAGGAAGCCACCACAACCTACGGAATTTACTGTCCTTCGGGGCCACAAGCCTCCAGGCC
ACCAACTTGATTTCTAAACCGTGGAATCAGCCTCCACTTCCCTCCGCCACCCCGAGGGTCTGCTCAGACCC
CCCAACGTGCCGCTGTTCTTCTCCCCCAAT
TTATTTAGAGAATATGCCTCTCTCGGGTCTGCCAAGTTTCCCGCTGAGACTTCCCTCGGTTCATCCCCAAATCC
TCTTCCCCACAGTCCGGGAGCCCCACAAGCTTACCGACCCACATGCTGGGGTCCCCCAACTTAAACGCGATC
CCCTGTCCCCCAGATTACCGAGTGATTTCCCTGGTCTCAGACTGGGACTCTTTACTGGAGTCTCGAATTT
AGCCATTAATCACAGTTCTCCACTCCGACGAGGCTCCCTTGGGTCCCCACGTCGGGGACATGGGTTCCTTG
CCTGCAAAATCAGGCTGCTCTGACTTGATTGAGCCCTTTGGGCATTGTTCGCCGCCCGCGCGGTCTCGGTT
TCCCCCATCCCCGCGCACGACGGGCACTGGGTCTG
GGCCTCTTGGTGTCTCTACAAGTCCCCGAGCTCCTCGGACTTGGGAAGTGTCTCTTGCCTTCCCCAAATAC
ACTCGGCCCGGAGTGTGTCCGCCAGGACGTAGGCAGAGCTTCTCCCGCGTCCAGGAAAACGACTGGGCATTG
CCCCCAGTTTCCCCCAAAATTTGGGCATTGTCCCTGGGTCTTCCAACGAGTGGGCGTTGCCCGCGGACACTGC
GGACTGCCCCCGGGGTCTCGCTCACCTTACGCGCTCCACCGCCCGCTGCAGAGCGCTCGCTCTCCGTCTCTC
GGCTCCAGCGCGCTTGGGGACGAGCCTCCGGGCTCCAGCCTTGGGTGAGCTCCCCGTGCGCTCGCGTGT
CCCGGCCCGGCTCCCAAAACCACTCGCCGCGCTC
CGCTGGGGCTGGCACTGGCCTCCGGCGACTGCCGGGGACACGGGAGCGGAGCGGGAGCCTGCTGCAGGCCA
GCCCGTCCGGCCGGGCCGCGCGCCCTGAAACGCGCGCGGCTTTGTTTGCTCTTGCAAAAGGTACAAACCGTGG
GGAAAACGCTTCGGCGGCCCCCAAGCGGGGACAGGAGGGCGTTGGGAAGGAGGGACACGCGGGAGAGGAGCAC
CCCGCTGGGGCGGCGCAGCGCGGCGCCTCCAGCGCGCGGCGGAGGATCCCGGAGGCGCGCGCGGAGCGCGG
GCGAAGTGATTGATGGCGGAGCGAGGGGGCCAGCGGATCGCGGGCTTCCCGCGCGCGCGGCCCCCTCCCTCG
GAGGGACTCGGGCGGCGCGGGTCTTGGGGCGG

SUBSTITUTE SHEET (RULE 26)

FIGURE 6, CONTD.

CCACACACACACATGCATTACACACACACACACTCGTGATACACACGTGCGCGGCACACACACACACA
CACACTCTCTCTCTGTGGGATCCCTGAG

Contig 19 (500 bp)

TGGCTCTGGCATAGGCTGGCAGCTGCAGCTCTGACTGGACCCCTTGCCCTG
GGAACCTCCATATGCCGTGGAAGCGGCCCTAGAAAAGGCGAAAAA
AAAAAAAAAACAACCAAACAAACAAACAAAGCCAAAACACACAGA
ACTC
ACAGACACAAGAAGAGACTGGTGGTTGCCAAAGGTGGGGTTCGAGGGTGGG
AAAAATGAGGAGAGGGGGCAAACACACAAACGTGCAGCCATAAAATGGT
AAAGTCCCGGGGACCTCCGGTAGCGCGTGTGGGGACTCGGGTTGAGAACA
CACCCTGATGTGTATTTCGCGAGTTGCTAAGAGTCCCTGTTGGAGAAACAA
ATGCGTATCGACGTGTGGAAATGAAAGTTAACCCGACCTGCTGTCTGTGAT
CACTTTGCAACACATACAGACATAGAATCATTATGTTTTACCCCTGGAGC
TGACAGCGTTATACGTCCCCCAGCCTCAATTTAAAAACAGCGTTGCCGTG

Contig 20 (400 bp)

TTCATACTGTGCAATGCCAGCCTTAAATGCACAGAGGAGAGCATTAACTT
CTTTGCAGAATCACTGAAATGATACCACTCATGTTTTGCAACTTGCACCT
GGGCGTTATTTTATTTGGTGGCGAACAGCGCGCATGTGGCACCAAACCTAG
CGCCGCTGTTTTTATTTCCCTCGGTATCCGCGCTCTCGCTGTCTTCCCC
CCCTTCCGCTTGCAGCTGAGGAAAGGGCTGAGAGGAGGAAAGTCTGCATT
CACCATCTCCCCCTGCCCTCTGTTGTCATCCTTCACAGAAGTGGTGGCCT
GTGCGGGGAAGTCACTAAACCTAGGCAGGTGTCCCGTGGGGTTCATGCTTG
TTACACCTTTGTGCACCTGGCCCAAGTTCTGGGTGGAGCGAGAAGCTGGC

Contig 21 (559 bp)

AGCTAGCCCCCAGCCAGGGCCAGGCCTCTCCTGCCACCCGCCCAGCCA
GCATGCTCAAGAGGAGGGGGCCTTAAGGGATGAGGACCTGCTCCAGTC
GGAGACACGAAGCCCCCGCGGCTCCTCCCCGAAAGTCCAGCTGCGGCTTT
CGAGCACGGCTGCGCCCTTCGTCAATCATTTCAGCCACAGAAGTGAAAGG
CGCTTTCGTGGCCGAGGCAGGCGGGACACAGAATGGAATCCCACCCCA
GCGAAGAGCCGCGGTGGGTGAAGCGGTCTCTGGTGGGGACCGGGCCGGG
AACTTCACATGGGGTTCGCTGTCCCCATCTCCCCATCGTCATTACTGCAG
GGGCTCGGCCACACCCGAGCTGCGGGGGCCAGTGTGGACACTGGACCT
GGCTCCGTCCTATGATGTATGTTGCGGGCGGGGCCAGCACAGGGCAGTGGC
CACACCTCGGGCCTCCAGCACCAGCCAGGATGGCAGAGGGCCCCACCCC
ACCACGGGGCATGTACATCCAGAGGACCAGCTGAGCAAGGCTTGATANG
GGCTTCAAC

Contig 22 (450 bp)

CGTGCAGGACCCGTGCGGGCCTTCCTGTGGCCACAGAGAACAACACAC
CATTATCTTCAGCCCCACCGCGCGGCTGTTAATGGGTAAACTGGGGCAA
GGGGGCCCCTGCTGAGGCCGGGGTGGGGAGCGCAAGGCATGGCCTGTGT
GCCCCAGCCAGTCTTTCAGGGCGCTGCTGTCTGCAACCGGGGGCCCCAG
GAAGCAGAGCACCCAGCTTCTCCCCATTCTAGAACCCAGCCCCCAGAACC
CTGGACCCAGACCCAGGCCAGGGGATACTGACAGAGCCACGGCAAGGCG
GCCACTCCACACCCACAGAGGGGGCCAGCAAAACCCAGTCACTGCGCAGC
CCATGCCAGGGGGCAGATGGGACACGAGAGCAGCCCTCATCCACAGCAG
GCAGGGGAGTGAACCTGGTGCAAAACGGGGCGGTTCCACGAAAGTTAAGCA

Contig 23 (535 bp)

TGCCAGAGACCTCAGAGCTGGGCTCTGCCTTCCCGGGCTGACACGGAGGG
CTGTGGCTTCCACCACCCAGGCCACAGCCAGCCTGCCCAAGTCCCTGAA
GTGTCCCCAGAGGTGGCCCTGCCTCCACGCCCCAACATCAGGCCTGTGCA
GCCCTGGACGGCCCCCTGTCCCCCGGAAGCCCTCGGGGCTCTCTCGCGTC
GCCTCTGGGGAACCCCTCGGTAATGTGGCCAGCCGTGCAGTGGCCGGATC
ATTTGCTCAGGGGGGCCAAAGGCAGGGGGGTGACACATCCGCAAGTACCG
CATATGCACAGGATATGGATTGGGTGTGGATTAAACCTTTTCGCAAATGT
CTCTCCGGTACAAATATTGTTTCTAATCCTCTGCCTCCCTGAGCCGGTG
AGTCTGCCCCGGGAGCTGCGGGGAGCTGGCTTGTGTGAACCTGCCCTGGCCC
CCACCCCCAAGGGAGCCCCCGGCCAGTGTGAGGGCAGGAAGCTTGGGCA
CAGGCTGCAGAGGCCAGCGCTGGCCTCAGTCACCT

Contig 24 (868 bp)

TATTGAAGACCCATCATGAGTCCCAGAGCGGAGGGGTGGAAGCAGGGG
CCTACAGCCCCTCCCCATCACTCCAGACCCGTCCGGGGCTGGTGTCCCC
TGCCCCCTACTCCTGTCTCTGGTGGGCGGACGCTCGAAGGAGGCACTCTG
GCCTGGAGCCTGGAGGGTCCCTGAACTCCCGCTGCCACCTGGGCCCTCGG
GCTCCTCCTGCGCTGGGACCCGCGGTGGTGGGAAGCAGCCCTGCTCAGTG
GGAGGAGGCAGGGCTGTGGCCGCCCCGCACGGCCCTGGGGGGGACGCACG

FIGURE 6, CONTD.

CAGGACGCANGTGGGCGTGTGTGAGTCCGTCTACACGTCCAGCCAAGGGC
GGCCGCGACCGGCCAGGGTGGGCAGCCCCAGCCTCAGCAGGGCGCTCTCT
GGGGCTCAGGCTGCGCCGACGGGAGATGAGGGGTGAGGCGCAGTCTGGGG
CTGCTGCCGCGAGAACCTCGCCAGCTGGCAGCTGGGCACAGGGAGACCTG
TACTCCCAGAACCTGAGGCTGGACGTCCGAGACCCGCGTGCCGGCCCTCTT
GGGTGCCCTGGTCAGGGTCTCTTTCTGGTTTGTGGGCAGAACCTCCTCAG
CGCGTCCCTTGTCATGGGGTGCTAATCACGGAGTAAGGAGCCAGAGAATGAG
GCACGGAGTATCCAGTGTTAACCTGGAGTATGGAGACGGGAGTACTAAT
TGTGGAGCATGGCTCTAAGGAATGGAGTATTCGTACGAGAGAACGCGGGG
CCGGGTGAAATACGGAGAGCGCGGTACGGACAACGGGGACGGGGTATCCG
AAGGGGAGGATGGAGTATCGGCCGAGGGTGGAGAATGGACACTAGAGGA
TGTATANNNGGCGTCAAT

Contig 25 (500 bp)

ACCAGTTTCGATGAGCAATCCCAGCGGCGTAACATTATGGCTGCAGCCTG
GTCAATGCCGGTGGAGTTTGAACCTCCACGCGTGGCGATTGTGGTAGATA
AATCGACATGGACCAGGGAGTTGATTGAACATAACGGTAAATTTGGCATC
GTTATCCCGGGCGTTGCAGCAACTAACTGGACGTGGGCGGTGGGAAGTGT
GTCGGGGCGTGATGAAGATAAATTTAATTGCTATGGCATTCGGGTGTGA
GAGGCCCGGTATTTGGCTTGCCTCTGGTCGAGGAAAAATGCTCTGGCGTGG
ATGGAGTGTGCTACCTGCGACTTCTGCGCAAGAAGAATACGACAC
GCTGTTTGGCGAAGTAGTATCAGCAGCGGCAGACGCGACGGGTATTTGTCTG
AAGGCCGCTGGCAGTTTGTATGATGATAAGCTCAATACGTTGCATCATTTA
GGTGTCTGGGACGTTTGTACCAGCGGCAAGCGTGTACGGCGGGTTAAGC

Contig 26 (900 bp)

ATGTTTGATGTCCGCGCTGCTGTAAAAATTTACGCTGCTCGCGTTCTTT
GGCTTCGTCCACCACCGGAAAAACGGACAAAAATTTCCGTCATACCTTTTT
CTTTCAGGCGGAAGCCAATGTCGTAATCTTCAGTAAGACTCTGCACGTCCG
AAAGCAATACCGTCACCGTCAGCTAACAGTGCGGTTCACGGCGCGGCGGCT
GAAACAGGTGCCGACGCTGCGCTGGGCACTTGTCCGGCGAGGGCTTCAC
GCACCGGAACATCTTTGCCATGCAGCTCTGAAAACTCATCAATGTAAGTC
ATGCTGGTGAAGTGGTCCATTCGCGTTCGAACGGATACACCGGGATCTG
AATCAGATCTTTACGCTCGACCAGATAGTTGAACAGACGCAATTCCATCG
GTGAAATCACATCTTCGCGCTCATGCAGAATAAAACCAGCAAAAGCGAAA
TTGGCGCTACGCTCAAAATTTGGGTGATGGCGTCCAGCACGTTGTTTCAGACA
GTCGGCTTTGCTGGTGGGGCCAGGACGCGCGCAGACTACCTTATGCACAT
TCGGGAAGCGAGCGCACACTTCGTCAACATCACGCTGAGTATCGGGGTCCG
TTGGGGTAGGTGCCAACAAAGATATGATAGTTTTCGTAGTCGAGCGTGGT
CGCCGCCAGCTCGGCCATATTGCCGATGACGCCCGTTTCATTCCACGCCG
GAACCATAATCGCTAACGGTTTTTCATCTGGTTTATACAGTTTCGCGGTAA
CTCATTCGCGGGTAGCGGCGATAAACACTCAACTTGCCTTAATGCGGCG
TACCAGTATACGACATCTATAAAAAAATCGTCCAGCCCGCTGATGAACA
TGATGACCGCTAACGTTATCGCGATTACTTTTAAGCCGTATAGCCAGGTA

Contig 27 (500 bp)

AGCTGGATGCCCCAGCTGTGGTCCCTTCCCTTCCCTCAGGGCAGGTTCT
GTCCCTCTTGACGCCACCGTCACTGCTGTGGACAGGTCTGCACACCCGCC
GTCCACCAAGAGCGTGGCAGGTCCCTGGGCACGGGCCGGCTCCTGACGCA
CCATGTGTTCAAGGCAAGAGCACTGGACAGAGGGTCCAGACGTCCCTTG
TCCTGCTCAGGCTGGGCGGGGCGAGCCCTGGCGGGAGAGGCCCTGGGCA
TCAGAGCCTCTGTGGCTGGAGCTTGGCGCCCTGCCCTCCCCACCTCCGT
CCTGCTCCTCGCCGCGCTGCACGGACCTCTCCCGGCCCGCCAGGCTCAT
ACTCTTAAGGACCCCTAGCCCCCTATGCTGAAATGCTGTACCTCGTGCTTG
TTTTCATCTGTTTATTACCTTATCTTCATTCTGCTTGATGATATCTGGT
TATTCCTTTATTGATTATATATCTTGTTCGTGTTTTTATAGGACACTGT

Contig 28 (450 bp)

AGTGGCGTGGGGCGTCTTGACGCTCAACACCGTATTTCCACGCGACCGC
GGATTCAACCTGGTCACACGGACGCCATGTAGACATGTTCCGGGGTTACGC
GCAGAGAAGCGACCTGCTCAACCGGCTGGTGAGTCGGGCCGTCTTCGCCC
AGACCGATGGAGTCGTGGGTGTAAACCATCACCTGACGCTGTTTCATCAG
CGCAGCCATACGTACGGCGTTACGTGCGTATTCCACGAACATCAGGAAGG
TGGAGGTGTACGGCAGGAAGCCACCGTGCAGGGAGATACCGTTAGCAATC
GCGGTATACCGAACTCGCGAACACCGTAGTGGATGTAGTTACCCGCGAGC
ATCTTCGTTGATTGCTTTAGAACCAGACACAGGGTCAGGTTAGACGGCG
CCGGTTCAGCAGAACCAGGAGGAATTCGGCAACAGCCGACGAACGCT

Contig 29 (450 bp)

FIGURE 6, CONTD.

TCAGGCCAATCTGTCTGGTCTCCAATGGGGACAATTTGGTTCTTTAGGCT
TCTGTCCAATGGTCCGAATGGCCCACTCCCCGGGCGCCGGCCAAGGGTCC
TCTGTGCCCTCGGGTGGGCTGGCACGGACCGCCCCAGGGTCTGTGCCAGCC
CCGTACCGGGGGCCAGAAGCTTCGGGCCTCTAGCTGGCTAGTCGGGCTG
CTGTGCAGGGGGGCTGCGCTGGGGGAGAGGGCGGGGTGAGGTAAACCTC
CCAGCCGCGGGGTCCCTGCCGAGCCCTAGGCGCCGAGACGGTGGCTG
GGTCCGTACCGCCAGACCCGAGGGCCTCGGGGCCCGGGTGACCCAGCTG
TCGCACACGCTCGCAGCTCTCTTGCTCATCAGGGCTCATCCCTCTGGACC
TCTCCTACTGCCCCACCTCACCCCGCCTGGACCCCATGAAGCCCCGCGGA
Contig 30 (600 bp)

TAAAACTAGCTCTAGTAGAAACATTTTATTTAAAAATAAAAAACCTGACT
ACGTCCGGGAGTTCCCGTTGTGGCTCAGTGGTTGACGAATCCGATGAGGAA
CCATGAGGTTGCGAGTTCGATCCCTGGCCTCGCTCCGTGGGTTGAGGATC
CGGCGTTGCCGTGCGCTGTGGTGTAGGTTGCAGATGAGGCTCGGATCCTG
CGTGGCTGTGGCTCGGGTGTAGGCCGGCGGCTACAGCTCTGATGAGACCC
CTAGCCTGGGAACCTCCACATGCCCTGGGAGTGGCCCTAGAAAAAGGGCA
AAAGACAAAAAACAAGAAAAAGGAAAAAATAAAATAAAAAAGACTATGT
AAATGAAATTAACGACTGCCTAGGGTGGGATTTACAGCATGGGAAGTACA
GCATGGCCGTGACAGTGCAAGGGTGAGGCGGGAATGGAAATAGGTTAG
GTGAGTTTCTCCTGCTATTTGTGATGTGGTCTGCTATCGCTTGAAGACGG
ACTGCAGTGAGATAAATATGTACAGTAAGCATCCGAAAAACCGCCAGAAC
GGCAAACGAATGACTCCAAGTAAGAACCCAAAAGAGAAAAGGAAATAAT
Contig 31 (450 bp)

GCGCGGGCGTTCCGGCTGGGGTATTTAACGTGGTCACCGGTTCCGGCGGC
GCGGTCCGTAACGAAGTACCGAGTAACCCGCTGGTGCGCAACTGTCTGTT
TACCGGTTCCGACCGAAATTGGCCGCCAGTTAATGGAACAGTGCGCGAAAG
ACATCAAGAAAGTGTCTGCTGGAGCTGGGCGGTAACGCGCCGTTTATCGTC
TTTGACGATGCCGACCTCGACAAAGCCGTGGAAGGCGCGCTGGCCTCGAA
ATTCCGCAACGCCGGGCAACCTGCGTCTGCGCCAACCGCCTGTATGTGC
AGGACGGCGTGTATGACCGTTTGGCCGAAAAATTCAGCAGGCAATGAGC
AAACTGCACATCGGCGACGGGCTGGATAACGGCGTCACCATCGGGCCGCT
GATCGATGAAAAATCGGTATCAAAAGTGAAGAGCATATTGCCGATGCGC
Contig 32 (450 bp)

GGTGGATGCTGGCGATAGCGTCATCCTCGCTTATGCCGTGCAGCGGGCAA
GGATAAAGCGCGGATAAACATGACCCGGCATCAGCCCCATGCCCGCAGA
GTACGGATTACCTTGCCGGTCAGCGCCAGCGTGAATGCGTGCGCCCGT
GATACGCGCCGCTAAAAGCGATGGTGCCGCTACGTTTGGTGGCGGCGCGG
GCGATTTTTACCGCGTTTCCACCGCTTCGGAACCGGTCGTAACAGCAG
CGTTTTCTTGGCGAAATCGCCCCGGCACCTTCTGATTATAATCTCGCACA
GCTCCAGATACGGCTCGTAAGCCAGCACCTGGAAGCAGGTGTGCGACAGT
TTTTTCAACTGCGCTTCCACCGCGGCCACACCTTCGGATGCAAGTGCCC
GGTATTGAGCACCGTAATCCCGCCCGCGAAATCAAGATACTACGGCCTT
Contig 33 (500 bp)

ACGTGAGGTTTGGGGAGGAAAGCGGGGACGAGCAGCCCGAGAGGAGTG
GGGGCTGGCCTGTGGCTGATGAACTCTGAGAAGGTTAAGAGCCCCATT
TTTGCTTCTCTTTTTTATTATGGAATTCCAAATGGATGCAAAAGTC
CCAAACCTAATGGACATCTTCTTGGTACCAGGAACGGTCAGGCATTAT
GATGCACCGAGCCCCGAGGGAAAAACCTGCCGTCTGGAGCCACGGTC
CAGCAGGGCACACAGGCCCCAGCCCGCAAGCGGCACGGCTGAGTCAGTGA
ATGGCGTGCCCTCTGGTCAAGGACGGGCACTCTGGACCCAGGGAAGCCT
CTGAGGAGCCCCCTTACAGCGTCAAAACTGTTAACAGGGCCATGTTTCG
CACCCCCCACACAGTGGTTCAGAAGCAGACCCAGGCATCGTAATATG
TCATCCGTGAGTTCCCTGTGTGCCACCAACAGAAAGCCCATCGTCACGTT
Contig 34 (400 bp)

CGGCATCGATGTACATGGTACGCAAGGCACCTCGTAAGGCCCGAGCCTCT
AGGCCTTGTCTATTGTACAGTGTCTGCTCGCGGGGATCAGCAGCCAGGCTTG
TGACCCCGGGCACTTTGACAGATAAGGACACAGAGAGGCCACAGCACTGG
TGTGAGGCCCCACAGCCAGCAGCCAGGGCAGGGAGGACTGGGTCTCACC
TGCCCTCAGCTGGGGCCAGCCTCCCTGGGAGTCCCGGAGTCTCCCCAGCTT
AGGAGTGTCCCTGGAACCTCTTCTCTCCCCTTCCCGCCCTCACCCGGAC
CCCCCTGCCTCCCCCCCCACCAACCCCTCCCCCTCCTTCTTTCACCTTGAG
CTCCCCCTCTGAGGACCTCTACTGTTCTGCTTATCCTCCCCTTTGAGCCA
Contig 35 (500 bp)

TGGCGGTGAACATATGTCGTGCGTGAAGAGCATTTGTGGTCCGTAGCGCGT

FIGURE 6, CONTD.

TATATGCGGGAAGTTTAGGCGAACTGGACAGCCTGGGTTTATCCGGTAGC
GAAATCCGCTTTCACGGTAAAACGCTGCTAGCGCTGGTGGAAAAAGCGCA
GACATTGCCGGAAGATGCCTTACCGCAGCCGATGCTTAACCTGATGGACA
TGCCGGGTATTCGTAAGCGTTTAAAGCGATTAAGTCGCTGATTACTGAC
GTGAGCGAAACGCATAAGATCAGCGCCGAATTGCTGGCATCGCGTCGGCA
AATCAACCAACTGCTGAACCTGGCACTGGAACTGAAACCGCAGAACAATT
TGCCGGAGCTGATTTCCGAGCTGGCGTGGTGAAGCTGATGGCGGAAGCATT
ACACAATTTATTGCAGGAATATCCGAGTAAAATCTTCCGAAGCCGGA
GGGCGCGCTCAGCGCCACATCCGGCTTCGGCAAACTACAAATCCAACACC
Contig 36 (500 bp)
GATTTTACAAGCCTGACCCACGCGGAAATGCGCTAACAGCGTAAAGTCGT
GCGGCCAGAATTTTTTCGTCTCTTCGCTTTGCGTCAATTCAAAAGTCAGC
GCTACGCCATCAGCATCTTCATGATGTGATTTACGCGTCCACGGCAGGTT
GCGGGGAAAACCGTGCGCAGGCAGACCTTGTGTGCCGCCGACCAAACC
ACGGCCAGCAAACCGGTACGCCACCGGAATAGCGACGCCATTTTTGAAC
GGTGTGTTGTTGCTCAACCACAGAACTCTTCTTCAACCGCAGGTTTCCA
CGAGAGAAGGTGTGCGCCCTGTAATGCAAAAGAGGCTTTTACCTGGGGAT
GATCGACCACAATGAGGTCCAGTTTATCCAGTTTACGACGGGAGAGGACA
GGGGAGATTTGTTTCGATGACCGGAAGGGCAAAAATTTTCTTAATCATGAC
GCAGTCCTTTAACTTCATTTTATCAGGTAAAAAAGAGCGACCGAAGTC
Contig 37 (300 bp)
ACCTGATCAGGCTCTGCACTGTGTTCAATCAGCGAGCCGAGATATTTGAC
CGCCCCATGCATAACGGAAAGGCGTGGGTAAACCCCGGGCGCGTTTCCTT
TATCAAGATGACGTTTCAATATTCGGGCAGGTGCAGTTTGTATTATCCAG
AAAGGCGTTGAGCGCGTATGAATATAATTCTGTGGGATTTGAAGCATCCT
TTTCCCTCCTTCGGTGAATGCGCTGAAAACGGCTTATTCAGCCGGTTCA
GGGTACGCCTGATAATTTGCATTTTAAATACCATTTATGGGTACTTTTT
Contig 38 (450 bp)
ATCCTTTTGGGGTCTGGCAATTACGCAATAAAGAAGGCCCCCATGCGATT
AAAGTCACCGGGCCCACTGTCTCTAATCATGGAGAAATTGTCCATCAGTG
GGGTCTCGATGGGCAGGGGATTGCTCTGCGTTCCCTGGTGGGATGTTAGCG
AAAACATTGCCAGTGGTCATTTAGTGAAGTGCTACCGGAATATTAACAG
CCAGCGAACGCTCTGGTCCGTTTATGTTTCAAGGCTGGCGACGTCAGCGAA
AGTGGGATAACGGTAGAGTTTTTACGCCAGTATTTTGCCGAGCACTACC
GGAATGTTTCACTGTTGCATGCCTGATTTATGATTCAATTATCGGGTTGA
TATCAGTTTTAAACCTGATTTTCTCCTTTCTAAGCCGCTACAGATTTGGT
AGCATATTACCTTTAATCGCGCATGATCTAAGATAATTGAAGAGGTTA
Contig 39 (450 bp)
AATGTACTGGCAAAAAGCCAAATGGCGAAGCGTGGGGAACGTTACATGCTC
TGCTGGCGGATATTAATAGTCAGGGTCAGGTGCAGATGGCGATGAACGGC
GGCATCTATGATGAAAGCTATGCGCCGCTCGGTTTGTACATCGAAAACGG
TCAGCAGAAGGTGGCGTTAAATCTCGCTTCAGGTGAAGGGAATTTCTTTA
TCCGTCTCTGGCGCGTGTTTTATGTGCGGGGAGATAAAGTCGGCATCGTT
CGTCTGGATGCCTTCAAAACAGTAAAGAGATTACGTTTGGCGTGCAGTC
AGGGCCAAATGTTGATGGAAAACGGTGAATTAATCCGCGTATTCATCCCA
ACGTCCGCTCAAGCAAAATTCGTAACGGTGGTTGGGATTAATAAACATGG
GAACGCCGTGTTTTTGTGAGCCAGCAGGCAACAAATTTTTATGATTTTG
Contig 40 (400 bp)
GACATTAATCATTTCAAATCAAAGCCCCGGTTTTCCATCGCCCGTTTGG
TGGCGTGGCACTGAACGCAATCGTTACGAGTGTAATAGTAATGCGCATG
ATTGATATTTCCGTTTAAATGAAGATACGGCGCGATGATACGCGTCGGG
TTGTCTCTCTGTTGATACAGAGATACTAGATGTAGTTGAAAAAGATTCA
ACCACACAATATATAGCCAGTAGGGGTCGAAATTACCTTGATATGAGC
GTGACGGGGTAGGGGATTTTTGTGATTACACAGGCAAAAGAAACCCCG
AAGACAGGCTTCGGGGTCAAAGACGCGTATTTATTATCATTTTTGCACTA
CGATTTGCGCATGCTTAACAGTGCGCCGATTAATAATCTACCGCAGCTG
Contig 41 (500 bp)
GCAAAATCACGTCCGCGACCTGGCGTTGTGCTGGGCCATATTGGCAAAG
GAGCTGGATTGCGGTGCCTGCAAAGTGCCCTGAATAATGCCATTGTCTG
TACCGGGAAGAAACCTTTTCGGAATGAACACCCACAGCAGCACGCTAAGCA
GCAGCGTGCTGAGTGCCACGCTTAAGGTCAGCCACGGATGATTACGACT
TTCCGCGAGTCCACGACCATAGGCGGCGATTATCCTGTGCAACATTTTTTC
CGAGGCACGGGAGAAAGCGTTCTGTTTACGCAACGACTCCTGGCTGAGCA
TCCGCGCGCACATCATCGGTGTCAGGGTCAGCGACACCACCGCTGAGATC

FIGURE 6, CONTD.

AAAATCGCTACCGCCAGGGTAATAGCAAATTCGCGGAACAGTCGCCCCGAC
GATATCGCCCATAAACAGCAGTGGGATCAACACCGCAATCAGTGAGAAGG
TCAGCGAGATAATGGTAAAGCCGATTCACCTGCGCCCTTGAGCGCCGCC
Contig 42 (400 bp)

AGCTATCTACGGCAAAAGGCACGGTAGTCAATTTCTGTTGTTAAATACATC
AAGCGTTTGGCGCCGAAATACCATCTGCCAGATGCCATTTTCATTTCTGAG
CGCACTGCATAACGGCTACCGGATGCAGTACGTCAAACCCGAACTGGGGC
CGGAAGGATTTAGCTTTTCTGCAATACACCGGCGGCACCACTGGTGTGGC
GAAAGGCGCGATGCTGACTCACCGCAATATGCTGGCGAACCTGGAACAGG
TTAACGCGACCTATGGTCCGCTGTTGCATCCGGGCAAAGAGCTGGTGGTG
ACGGCGCTGCCGCTGTATCACATTTTGGCCCTGACCATTAACTGCCTGCT
GTTTATCGAACTGGGTGGGCAGAACCTGCTTATCACTAACCCGCGCGATA
Contig 43 (450 bp)

GATTAGCGCCAGATGCTCGCCATCGAAAAGTTGAATCAACCCAGCTGCG
GGTAATAAGTGCGCTACGAACAAATTCAGTATCCAGGGCTATCGCCGGA
AAGGCACGGACGGCTTCACACAAAGAAGCCAGCGCATCGTCCGTGGTAAT
CATTTGGTAATCAAATTTGTTTCTCTTTAGTGGCGGTCAAAAAAACGC
CGGATTAACCGGCGTCTGACGACTGACTTAACGCTCAGGCTTTATTGTCC
ACTTTGCCGCGCGCTTCGTACGTAATTCGTGCGAAAATTTTCCGAC
GTTAGATTTGCGTAACCTCATCACGAACTCCACCAGCTTCGGTACTTTGT
ATCCCGTGAGCTGACGGCGGCAAAAAGTCAACAGTGACTCTTCGGTAAGC
GATGGATCTTTTTTCACTACGAAGATTTTACCGCTTCACCACTGGAGCC
Contig 44 (750 bp)

GAGCAGCCCGCGTGATGACAGGCATGCGCCCGCGTCGGCTCTCTCTCTCT
GGTGCCTGAGTCACAGGATGGCGGCGGTGGGCGCGGTGGTGGGAAGCGGT
CCTGGAGGGCTCGGGAGGGAGGATGCGCTCAAGCTGGCTCCCCGTGGGGC
TGGCCCGGAGTAGCCTCCGTGAGGGCACCGTGTCTGCTCCAGAGCCCCG
TCCCCGGCCTGCCCTGCCCTCCCTTCCCTGCCCAAGTTCCCCCGAGCCCC
TGGATCCCGATGGGAGGCGCCCCCTGGGGAGAGGGGACCAGGGAGGGGGCC
AGAGCTCTGAGGCCACCAGACCTGGCCAGGACCTTCGTGGGAAGAAGAG
GTGGGGCCCCAAAGGCACCTAGAGAGAGGGAGGCTCTGCTGGCTGGGGGGC
CTTCCAGGCGGGGCTTCCAGGCAGGGCCAGTGTCTTGGGGGCTGGAGGGA
GTCCCTGGCTGCTGGGGGGCGGCAGGAGCACCTGGGGCGTCTGGGAAGAG
AGCGGGAGGAGACTGGAGCCAACCTGGGGGGACAGAGGAGGGGTCCAACCC
CAGCGGTGGTGTGGGGGTGCTGGTGGTGGAGGCCCTGAGAGGCTGTGCT
GGGGGGCAGAGCGGGTGCTGGGAGGGGAGAAGGGGTCCCCAGGGCTCATG
GGCCCTTCGAGCAGTGGCAGTTGGGGTGGGTGGCTGTCTCTAGGGCTGT
ACCACGGTGGGTGCCGTGGAGAAAGAGGTCTACCCCTAGTCTTTGCTGCA
Contig 45 (300 bp)

TGGGGACCCCACTCCAGCCCCACTGAGTGACGCGCCCCCTGTGGTCCCA
CCGCCAACCTGCCCTCACACCAGAGGGGCTGTGGCCACACCTTGCCACA
GCCTGTCCCTGAGACCACGAGCCCCCGGCTCAGCCCCCTCCTCACCCCT
GGACCGAGGAGAAGCCCCACCTGGGCTCAGCTCTTGGAGCTAACTTCC
AGGAAGGTTCTGGTGCCCTCGGGTCTTAGAGCATGGTGGGGAGGGGATG
CTGGTGGGGGCGCAAGCCCTCCCAATTTGCACTCGACCCGGTGGGNG
Contig 46 (300 bp)

CCGGCTAGAAGCCACGAGAGCCCCAGGCCCGCCGACGTCTCTCCTGC
AGGGATTTCGGCAGCCCTGGGGCCACAGGGCCTGAGCAGACCTTGGGGTTT
CGGTGTGACTCCAGCCAGGTCCCTACTGTGTAGGCACAGGGCAGAGTC
AGCCCTGGGACCATGGCCACAGCTGCTCCCGCTGAGCCGGGCCCCCGC
CCAGGCTGGGCCCCCTCAGTGCACGTGCCCAAGCCAGCTGCTCTCCCCAC
CTCCACCTTCTCCATCCAGGTCTTCCCCACGGCCTTTGCTCAGGCCAG
Contig 47 (500 bp)

TTGACTGGCACTAGCACGAGCTCTGTACCCGGGGATCTGGGCTCGGGAGA
AGGGAGACCCCCACCGCGAGGCCGAGGGCGCTGTACACCATGACTCT
CAGCCTTCCCCACCGACGACAGAGTGACCTCTCCCAAGCCCCCACT
CACCCAGGACCGCACACCCCGTGAGTCTCGAGTGGGGGCGGCTCAGGG
GCCCCAGTCCCAAAGGAGTCTGCTGGCCCTGGGGGGAGGGGAAGCAGC
AGGGTGGTCACGGGTCTCCCTGGTTGGCAGGACCAAGCTCAGCCCGCT
GCCTCCCAGAGGGCAGCCGGACACCAACAGTCCGGGGACCCACGTACC
TCAGTCTGGCAGGTGCCCTGCCCTGACTGGTGCCAATGGGGCGGCTGG
GTGCTCCCATGGACAGCTCGCCACTCATCCCAGCCGCTACCCCCCTTCC
GGGTCCAGTGTCCGGCCGGCCACCCGCTGCCAGCCCTGGCCTCCTCTC
Contig 48 (500 bp)

FIGURE 6, CONTD.

GGGGTTGCCGCGAGGCTGCTGTGTAGGTGCGCAGACGCAGCTTGGATCTGGC
GTGGCTGTGGCTGTGGCTGTGGCTGTGGCATAGGTCAGCCACTGCGACTC
CGATTTGACCCCCAGCCCGCAACTCCCACATGGCAGAGGTGCAGCAGGG
AAAATAAATAAATGAAATAAAAAATAGGTGAAGACAGTGGAATTCATCTCT
TGGGGTTGCGGTAAGCTCTACACAATAGGGAGTTTACCATTTTACCTGTT
TCAAGTGGCACTGAGTCAGCTCACAGTCCTGAGGGCCACAGATGCCGTC
TGCCTGGGAGATTGTCTCTCACCACACTGCCCCCTCTGTCCCCACTAAA
TACTCACTGCCCTCCCCGTCCCAAGGGCCCCCTGCCCCACCCTCTGCTTCC
TGTCTCTGAACCTTGTGTGGCCACCAGCGACCGTCTGGTGACCTCACTCTTC
GGCCCCATTTGTGCGCACACCCACCTGGCCTCTCCCCGGCATGGGCAGAN

Contig 49 (600 bp)

GGGATATTTGGGGGCGATATTTGGGGGGGAGATCCCCACAAGGCATTTGGG
GTTTGTGGTTTGGAAATGCCCCCGGGCCCGATGGAGGGGGCCGGGGAAGAA
TCTAAGCCTTACTTGGGGAGGGTTGGGCCCCGGGGCCCCGGGCCGGAAT
GCCCCCAAGACAGAAGGTGTACAAAATTTCTCAAAAGGGTGACCCTTAAT
GAAACGGTCCCGGTTGGAAAGAGGTCACCAGGGTGGATTGGTGGCACCG
CAGAATTTACGACATTTTGGCTCTCTTCCAATGGCCGGACGCCTGGGGAT
AGGCGCCCCCGTGGACGGCGGGGTCTCGGGTGGGACGGGCGGTACAGGGT
CGGTGACGCTTGGCCTCTCTGACCGCCTCCAGCTCCTTGGCGAGCGTGCG
AGCGCGGCGGGCGCGCAGGAGGGCCGCGCAGGCCCTGCGCAGGCGTTGG
GCGGACTGCTTCCAGGTGTCTAGCGGAAGAACTTGCCACAGGGGTATCT
GGGGAAGTTGTCTGAGAGGGGAAGGGCCCGTCAGGGGGGGGCTGGCCC
CCCAGCCCCGTGCCAGAACAAACCTTTGCGGGGTCTCTCTGCCTGCC

Contig 50 (179 bp)

ATCTTCATATTCATGCGAGAAGACACTCTCCTGCCTTTCTATCTTGGGGAA
AAGGACGATGTCACTTATGCAATAAAGCCCACTTGCTGGCCGGGGCTTGA
CATTATTCCTTCTGTCTGGCTCTGCACCGTATTGAACTGAGTTAATGG
GCAAATTTGATGAAGGTAACTGCCACC

Contig 51 (500 bp)

CTCGGGCTGCTTCCAGGGGGCCTTGGGGAGCCATAGAATGCTATGGAGCA
AGAGAGTGCTATGGTCAGACGACTTTGGGGGAAGGTCTGGGAGAAGAGGG
GTGACTGGCCACTGTGATAAAGAGTGGGCGCTTCTTGAGATAACACGGT
GGGCAGCCGAGGTGGACCTGTGCAGGTGGAGAAGGCCTCCTGCCGCGGCC
AGTACGTGGCTCTGGGCTGCCGGACACGAGAAAGCCCACCTCCACGGCTG
CCTCCAGGGCGGCCCTTCCTCTCTTACACCGCCGGGCCATGCCAGGTGC
AGGTGCCATCAGAGGGTGCTCAAGAGAAGCTCTGGGCTGGGGTTGTCCCA
GGTCCCGGAAGCCCCGTGTCCAGGGGGCACCTGAGGAAGCGTGGGCGCA
CAGAGACTGTCCCTCGGTGCTCAGAGAGGGTCCCGTCCCCACGGCAACGA
CGCCCCAAGGCGGAGGTGGTCAGAGGTCTTGGGAGGGAGGATGGCCGCGCA

Contig 52 (900 bp)

TGTGTTGCACCTGTTGCTGCCTGTGACTCTAGAGGATCAATACTCCTTA
CATAATTAAGGAGAACAATAATGGAACCTAAAAAATGATGGGACATATTT
CTATTATCCCCGATTACAGACAAGCCTGGAATAAGGACATAAGTTATCG
GATATTCTACTGTTGACTATTTGTGCCGTTATTTCTGGTGCAGAAGGCTG
GGAAGATATAGAGGATTTTGGGGAAACACATCCCGATTTTTTTGAAGCAAT
ATGGTGATTTTTGAAAATGGTATTCCTGTTCACGACACCATTGCCAGAGTT
GTATCCTGTATCAGTCCTGCAAAATTTACGAGTGCTTTATTAAGTGGAT
GCGTGACTGCCATTCTTCAGATGATAAAGACGTCATTGCAATTGATGGAA
AAACGCTCCGGCATTCTTATGATAAGAGTCGCCGACGGGAGCGATTCAAT
GTCATTAGTGCGTCTCAACAATGCACAGTCTGGTCATCGGACAGATCAA
GACGGATGAGAAATCTAATGAGATTACAGCTATCCAGAACTTCTTAACA
TGCTGGATATTAAGGAAAAATCATCACAAGTATGCGATGGGTGCCAG
AAAGATATTGCAGAGAAGATACAAAAACAGGGAGGTGATTATTTATTCG
TGTAAGGAAACCAGGGGCGGCTAAATAAAGCCTTTGAGGAAAAATTTT
CGCTGAAAGAATTAAATAATCCAGCGCATGACAGTTACGCAATGAGTGAA
AAGAGTCACGGCAGAGAAGAAATCCGTCTTCATATTGTTTGGCATGTCCC
TGATGAACTTATTGATTTACGTTTGAATAGAAAGGGCTGAAGAAATTAT
GCGTGGCAGTCTCCTTTCCGTCCATAATAGCAGAACAAAAGAAAGAGCTC

Contig 53 (450 bp)

CCAGCCACCAGCTGGACCCTCCCGGAGAGGGGCTGCCTCCTCTTTCCCGC
CCAGACGCCCCCAGCAATCTGTGGCCAAGAGGGAGTGATACCGAAGATG
GCCACATGGGGGCGCCAGCCACAGGGAACCCAGGAAGGCGCTGGACCG
TCAGGAGTCAGGGCTGCTGTGCACCCATGTGGCCTGGGGACTTTCCACAG
CCTGGTGGAGATGGCCGGGCACACCGCTGCCTCGGGGGAACGTGCACACG

FIGURE 6, CONTD.

GGTGGTACATGTGGCCGGAGCCCAGGGCACAGGGTGAGGGGAGAAGGGAG
CATGCGGGTGCAGACTCGGAGCCCCGCGCTGAGGTGCTGGGTCTCAGGA
CACGCTCTGGGAGTGGAGGACCCCCATCCACGCCCTCACCAGTGTGTGC
CCGCTGTCCCCCGGAAACCTCACAGACACGAGGGCACACCCAGCCCC
Contig 54 (1133 bp)

ATGGCGCTCATAGAAATTCGACCTCGGTACCTTGGGATCTTTTGACCCCT
ACCTCACGCCATCTACAACATTTACCTCCGAATGAATGAGAGACACAAA
AGCAAATTCATAGAAGAGAAAAAAGGTAACCTGGACTTTAAAAATGTAA
ACTTCTGCTCTTTAAAAAGGCAGTGCTAATGAAGTTCAAATACAAACCACA
GACCATAAGAAAAATACTTGCAAATCTTGTCTGACAAAGACTAGTGTTC
GAACATACGACGATCAGGGAGAGGAAAACAGCAATCCTATAAACTGGA
CAAAGAATTGGGGGGAAAAAAAACCCACTTGGCCAAGAAGTTGGTAAATA
AGGCCATGAAAACATGCTCAACATCATGAGTCATTAGAAAAATGCAAATT
AAAATTATAATGAGATACTACTACACAGCTATTTGAATGGATAAAAAATG
TTTTAAAACTGATTATACCCAGGTTTGGCAAGAACATGAGAAACGAGAT
TTTCACACACGATTGGTGGAAAAACAGAAAATGGTCCACCCACTTTGGAAA
AGAGCTGGGCACCTCCCTCAAAGTTAAACATACATCCAGGACCTCACAC
AGGCTTTCCACCACAGGTGTTTATTCAGAGACATGAAAGCGCTCATCCA
CACAAAGACTCGTAAATGAAGGTTTATAGCACCGTTTGTGGCCCGAAGT
AGAAAACCCAAATGACCTTTAAACCAGAGAATATCTAAACAAAATATCCAT
TCACATTAATCACCCATAAGAAGGAACGGGCTATGGGGACGGGAACCGTA
TTGAAGAGGGTCAAATACATACGCAGCATCAAAGAAGCCTGCCCAAAGG
ACACACACTGCAGGGTTCCATGGACTGAAACTCGAGAAGGTGAAACTCG
CCAGCAGTGACAGAGAGCAGGTCCGAGATCAACCTGATGTGGAGGAAAGT
GAACCTTCGTGCGTTGTTGGCAGGACTATAAACTGGAGCAGCCCTACGG
ACAACAGTAGCCCGGGCTCCTCTCCTCCATCTCCCTGGGGAGCCTGAGCC
TTGAGACGCTGGGGCAAGTGCACGGCATGCTGCCCTCACGTGGGGCCCCGG
TGAAAACACGTGGCAGCTGGGGAAAGAATCGTA

Contig 55 (735 bp)

TACTGCCCTGTCTCTATGGACTTGACTCCTCTCGGGACTTCATGCGAGGGA
TCTTACAGAAATTTGTCTTTTGCATCTGGCTTGTTTCACTGAGCATCGTG
TCCCCAAGGTCCATCCATGTTGCAGCCTGTGTGAGGATTTCTTCTCTTT
CAAGGCTGAATAGTACTCCACTCTGCGGATGGACCACGTTTGTATTATCC
ATACTAGTAAATCCATACATAAATCTGTTCATGAAGCCACAGCTTAT
GCTACCTTCCGTGGGCTCCTCCCTGCCCTGTCTCTACGCTTCTGCTATA
GCCCCATCCCCCTCATCCAGGCCACGCCCTCCTGTCCCCCTGGACACTGTC
CCAGAAGCCAACTGCCCTCTGACTGCTGCTCTCGCCTGACGGAGGACAAG
GCAGGCTCAGGGGTCCACGGGCTGGGGCCCCAGGGCTCCCCATGGCTGGT
GCCCCCTTCTGTATCCAGAAGTACAGTGGCAGCACCAGCTTCCAGCTGC
CCCACCTTCTGTCCGCAGGCTGCTCGGGTGGGGGCAGGTGGGCAGTGATG
TCACCTGCTGTAACCACCTACCGTCGCTCATCCCTGTCCAGGAGGTCAC
GGTGACCTTGGCAAACATTTCTGAACAACACACACCTCCCTCTGCTTAGAG
GCCGGGGGCTCCCGGGGTGACTGGGGGCACAGGCTGACCCACGCTGTC
TCTGTTCTCTGAAGGACATGATAAGTACTGCAACA

Contig 56 (500 bp)

AGGAAGAACAGGAAACAACGGGTTGAGGAGAAGAAACGGGTGTCTGGCA
GGGGCACGTGCCAACGGTCCACCGGTGCTGCCGCGCTGCGGCCTGGCGC
CAGAGGGGGCAGCTCCGCCCCCTCGGGCCGCGCCCTGCCGCTTGTGCTGGC
TCGCGGCTGGGCTCTGCTTGGCTGGGTACAGCTGGGTGCAGCCGACGGC
TGTGGTGGGTGCCGCGGGTACAGCAGCCCGGCCCCACCCGGCCCGTCTC
GCCGGCTGGCCCGGGCAGCCCTCCTGCAGTCGAGGAGTCCGCTGACGG
GCTGATTGGTCCACAGCCTCAGATGCAAACCAGCCCCACGTGCCTGGAGC
CAGCCAGCCCGGGACACCCCTGGTGGAGGCAGGAAGGCAGCAGCCTGGAGA
GCCGCGCCGGATGATGCTGCGGGGAAACCGGGTCCCGCCGGGGGCGCCC
TGGCTCTGGCCAGGCTTGGCTTGAATGCTGACGTGAGCGGTGGCCCTATA
Contig 57 (500 bp)

TGGCGTTGCAGTGGCTCTGGCGGAGCCGGCGGCTACAGCTCCGATTGGA
CCCCTAGGCTGGGAACCTCCATAAGCTGTGGGTGCAGCCCTAAAAAGCAA
AAAACCCCAACATATATATATATATATATATATATATATATATATATAT
CATAAAATAGAATTTACCTTCTTAATAATTTTTCAGTGCACAATTCAGTGG
CACTAAGCACATTCATGCGGCCGTGCACCTGCTCCAGAACTTTCCATCT
ACCCAAACGGACTCTCCGCCCCATGGAACACGCCCCCTGCCCTCCCCCG
CCCCTGCCCCGCCAGCTCCTCCCTGTGTCTGTGGATCCGGCTCCTCCAGG

FIGURE 6, CONTD.

GACCCCGTGCGTGGGCTCACAGAGTGTGTGTCCCTCTGTGACCGATCGTC
GTGTCCCGGAGGCCCGTTCTGTGGCAGCTGCGTTATGACCGACTACCTTC
GAATGCTCAGTGACTGCCGTGCATTGGACACGCAGTCCGCTACCCCTTTTC
Contig 58 (550 bp)
TGCTTTCTGTGCCCCCTCCAGCTTGGGACCCAGCAGGGCAAGGGGTGT
ATAGGGCTTAAGGAGGCAGGGGGCGTCTCCTCCCGCTGGCTGCCCAGAGC
ACCCCCAGCCCCGCTGCCCTCGTCCATCTCCAGCCTGTCTTTCTGT
GCCCTCCCTGTCCCGGGCGGGCCGACACTGGCTTCCACCTCCCCACCCA
ACTGGCGGCCCGGTCCCTTCTGTGAGGCACCCGAGGTCCCCGCTGCTG
GGGACCAGCTGGCAGGTGGGTCCCACTGCTTTCTCAGCGTGGGCTTTTGA
GGGGGGATCTGCACATACCATCCCTTCAGGCCCGTGGGGAGCCTGGGGGA
CCATCCGGGACCCCTGTGGGCAGGCCAGAGGACTGCCAGGAAGAGACCC
AGGGGACCAGGCAGCTCCCAGGCCCTCTCAGCTTCAGGCCAGGGGAGCCCA
CCCCCAGGTGGCAGGTGAAGCCAGGCCCCCAACCCACAAAAGTGCCCGCA
GGGAAGTAGGAGGACAGGAGGAGGGGAGGCCAGGCCCGGGCCGCCCTTG
Contig 59 (800 bp)
TGAGGAGCGCAGGCCAGGCCTGAGTGTGCCAGCTTACACCCCTGGCAG
CTTCGTCCCTCCTGGCCCTAACCCCATCCTACCCAGCAGCAGGGGCTC
CCCCGGTGGGGCCTGGTGAGCGTCTGACTGGGGTTTGGAGTCAGGTCTGC
TCCAGGCTCAGCCCCCATCCCCAAGGGTGGCCTGCAGCACTGCTGCCAC
CCCCTAGCGCCCCCAGACCTTCGCCCTCCAGCCTGGATGTACCCACGGA
CCCTGAAAAGTGGGGCTGAGCAGGTGCCCTGGCTGGAGTCCCCCTGACTT
GGGGCTGGCCAGGCTGCCCTGGAGGGGCTGTGGGGGACAGCCTGCCCCA
GGGGCCCGCTGGGCACTGGCTCTGGAGCTGACGACAGGCAGGCCCTCTCT
TCCTGGCGGGGCCACACCCTGCCCTGGGGTTTGGGGCCAAGGCGGGCAGC
CCCCATGTGAGCGGGGGCGAACCAGGTAATTACAGCCTGGCAGCCCGCT
CCCCAGACCCCAAGCCCCGAGGGGCCCCACCCAGGCTGTGCCACCAAGA
CCTGGCATCCAGGGCCCAAGCAGGTCAAGGGCAGCTGCTACAGATTCTT
TTAAGTTGAGACAGAATCGACACATGACAAGTTCTTGGTTTATAGTACTT
CGCTGCCGGGGCCGCCAGTCAGTTTAGTGACCCAGCACACCCACACAGG
TACAATTGCTCTTCTCAAAGAGGGCCCTGAGAGAGCGCCTGTCTTGGCT
CAGGGGTAATGAGCCCAATGGGTATCCATGAGGTTGCGGGTTCATCCCC
GGCCTCGCCGCGTTGGTTA
Contig 60 (500 bp)
GGCTCAGGAAGCGCAGGGGCGAGCGTGTGGGGCGACGGGAACCATGGGGGT
CTGTCTTCCC GCCTCTCCTCAAGCCCACCGCCCTGCTGCCACCTCCGAC
TCTGCAGCCAGCATGCCGGCTAGAGCCCTGTGCACCCAGCTGGTGGCCT
CTGGCTAAGGGCAGTGCTGGCTGTGGACGCGTGTCCCTCCCCAGCAGCC
CAAGGGTCCCATCTGCCAGGCTGGTGGCTGAGGTCTGCCCTGTGTGGTCC
TTGCAAAAACCCCGCCCTCTCCTGCCCTTGAAGCGTGAGGGAGACGCGG
GCTGGGCGGATGCCCTCGGGCACAGCCGCCCGCGGTGGCGCCCTGTGAG
GAGGGGGCTCCGACGTGCCCTGACGGCCCTGGCCGGGGGAGAGGGTGAG
GCCACCTCCTGGCCACGTCCACCCAGCTGCCACGCCGCTAGCCAGTGGC
CCGGGGCCAAGTCAGCAGAGCCAGGCTTCCGACAAGCAGAGGCTGTAGGC
Contig 61 (700 bp)
GATGAGGAAGCCGCTGCTCGTCTCTCTTCTTGGCCTTGGCCTCGT
GCTGCTATGCTGCTTACCGCCCCAGTGAGACTCTGTGCGGCGGGGAGCTG
GTGGACACCCCTCCAGTTTGTCTGCGGGGACCGCGGCTTCTACTTCAGTAA
GTAGCTCAGCGGGGCACGGGGGCGGGGCGGACACAGCAGGTGCTCCATCG
GTGCTGCCCCGCTACCTGTGCGGGTCTTTCGGGATGGATGGTGTGGGGGA
CGGGGGGCGGGGGGCGGCCAAGGGAGGACCTCTCCTCCGAGGGTCTGAGA
CTTCAGACCGGGGGCGCCCTGGCCGTGCGCATTGATTGGCACCTGCCATG
TGCCTGGCTGGGGCTCACACCCCTGACGTTCTGTCAGCGTGACTCGAAA
CGGGAAACCGAAGGGACGGGTGGCACGGGTGGGGAGGCAGACCGTGAGT
GGCAGGCGTGCGAGGGGTTCTTTTCGGGCGGGGTGGCCAGGCAGGCCCCA
CAGGATGACAGCCTGTCCCTCCTGCTCCTCCTTGACCTGCCACAGCCA
GGGCTGCAGGCACTGACATTACCCATGGTATTGTGGTGCCTTGACGTCT
TGGCAGTGGGCATTGGGTTTCATGGACTGTTTGGATTGAAAAGTGGGAATA
AGATGGGGTTTGA AAAACCCAATTAAGAAATAAAAGGGCGCCCTGTGGGC
Contig 62 (300 bp)
TTTGAAAAATTTTGAAGTCAAGTGCAGAAATTCGCATCTATTCCGCATTTCAGG
CTCTCCTGTTCTCACCTTGCCCTTAGTGCGGATCTTCTATAACCACACAG
TGACGTTTTCAAGGTACTTTATTGAATAATAAGAAAAAGTGCACACAAT
CATGTAGTTAACTTTCTGTGCTCTTTCAGGTTTGAAGGGACCCCTCTTTT

FIGURE 6, CONTD.

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TTTCCTTTTTAGGGCTTCGCCGACGGAAGTTCCCGGGCTAGGGGTTGAGT
CAGAGCTGCAGCTGCTGGCCTACAGCACAGCTCTTGGCGGCGATGGATCC
Contig 63 (450 bp)

TCCTGGGCCACAGGCTGCAGCAGCTCACCTGGGGGCTGGGGTCTCGCTCT
GCGGATGGACCCATGAAGGCCGGAGCCAGGTGGGGGCGGAGACGGCAGGG
CAAAGGGTCTGCACACACAGCGTCCCCCGACCCGGCTTCTCTGGGTTCT
TGGGGGGTTGGCGAGGCTTCTCTCAGTCTGGGTTTCTGGGGAACTTTCA
AGAAGTGGGAAGTCTTCCAGAAAGTTGGGGTGGGGGAGGTACCCCCAAA
GTGCTGCTCCTGTCCCATCCCCACCCCGCTGTCCATCGGCGAGACCCC
GGACCGCCGTCTCCCTGCCGAGGTGTGGGGTCCCCCCTCTGCCGGCCAG
GCTGGGCAGGGGTGAGCGCCCCCTGCTCTGCACTCGGGACTCAGCCTGGG
GAAGCGGGGCCCCAGGAGGTCTTGGCCTGGACGGCAGTGACCTTCCACCG
Contig 64 (500 bp)

TGTGCATCCAACCCAGTGGCCACGGGGGGTGAACCTCGGCCGGTCAAGC
GCCCCGCTCTCCACGGAACCGGGCCTTGGCCTGAGGCAGAAGGACCCAG
GACTCCATCCCTGCCCGGACTCTGCCGGAGGGTGCAGTCTGCACAGAGA
CCCTTGGGGGTGAGGCCGGTCCGGGCTGGGGTTGAGATGGGATGGTCAG
GGCGGCCCCCGCGGGCCTGCAGGAGGCTGGGTGAAGGAGGGGGCCAGCT
CAGACGCCCCCAAACCTAGCTTGGGAGAGCTGCAGCCCCGCCCCGTCAAT
CGCGACAGCCTGCCACAGAAAGGCATTCAAATGAGAGACAAATATTTGGG
CTTGAAGACTATACCCAGCCACGTCTCTTTGGGAGCCCAAGCTGCTCCCA
GGCCCTCATTTGGGTATTAATTGGTTTTCGTTTAGAGATTTGCATGCTTA
TCAATGGCCACTGGGCGGCTGGGCTGGATGCGGTCCCAGGCTTTGTATG
Contig 65 (661 bp)

TCCCACGACCTGCCCCCTCCAGGGCCACATCTGGCGACACCGTTCGCAAGAG
TTGGACCGGGCTGGTGTGGCCACAGCCTCAGGCCTTGTCTGGCCGCCAG
GCCGGCTCCAGGCTCCAAGGAGCTCCTGCCTGCCCTCCGGAACCCAGCA
CCCCGGGCGCGCTTCCCCACCAGACCTGTTTTTCCAGGTCAAGGTCACAG
CTAATTTGGGCTTAAACTGGACAAGGAGGCCTTATCTGGAGCAGGCTTCC
GGCCCTTTGGCCTCTGCCCTGGTGGGAGGCCTTCCCAGAGGCTGTGTGT
TGGCGCTGACCGTGCAGCCCTGAGCTTGAACCCGGATAAGGAGGGACCCC
ACCTGGGCTGGAGCCAGAGAGCCCTCGTTCCCAGCTCCGCAGGGTTCTC
ACAGTCCCGCCCCCTGCCCTGGGGACCTGGACGTCCCCAGCAGGTGAAAG
GTCCAGATGCCCTCTGACTAGAGGCTCCTCCGCTGTCAGACATGCTCCCT
TCCCGCACCGAGGACGAGACCTCAGCAGCCCTGCGTGGCCTGGGGTGCAG
ACCCCAAGGCGTCTCTGAGTGTGTTCTAATGGGGAGCCGTGGGGCCTCAA
CAGTGGGGGTGGCACTTGGAGGGGAGCCTCCCCACAGCTGCCCCAAGATG
GGCCCTGGACT

Contig 66 (500 bp)

TTTGTGGATGAATGAAATCATGAGAAAGTGATTGGACCGCCCCGTTTCGT
CCAGCTGCTTGCCAGCTGCTTTGTAAAGATGACCTCTCACCTTCTCAGAG
GCCTGGCCGGCCCCGAGGTGGCAGTCAGCTGAGATGCCATGCTTGTGTTGGC
ACGTGGGAGGGCCCCCTGTCCACGGCGTGGGTGCCTCTTGTGTCTAATCAGG
GTCAGGGGGAGCAGCAGGTGCAGGGCACATGTGGGGCCGGGGCCGATGTC
TGGGAGGGGCGGGAGGAGGGGTGTGCGGAGGCCGTTGTGGGGGTGCAGG
GGACAGACCCAGCGAGACCTCCCTGGCCAGGCACAGGACAGGTGATG
GGGGGCCGCTCCGGGGCGTGTGACAGAAGCCTCTCAGAGGAGGCCCTCC
CACGGTCTCTGGACCATCAAGGGACCGGGGCGCTGGGCCTGGGGGTAC
ACCCAGCTGGCCGGCCAGCCCCGGTGGGGTCGGAGGCCCGGGCAGTTTAC
Contig 67 (550 bp)

GGGCAGGAGGGGCCCCGGGCTGGTGCAGGAGGTGGAGGTGGTGCAGGAGG
GTGTGAGGCAGGGCTCACTGAGCGTGCGCGGCTGGCTGTGCCCTAGAGTG
GTTAGCACGTGCCCCACCCTCCAGTGTGCTCTGTTACCTGTGCCTGG
CTCACAGGTGTGGAACTGAGACTCGGGTGTTCATGAGCTTCCAGGATG
AGAATCAGCAGGCTTCCCAGGCAGGGCTGTGTCCGGGGCTCTGGGCTCTT
ACCAAGGAGGGGACACCCAGGGACAGCCCTGCTTGGGGGTGTGCGGCTGG
CCAGGCTGGGTGGTCCCTTCTGTGGCTGGCAGCCCTTGGCAGTCACCCCC
TTACCCTCAACTGCCCCCTCAGCTGAGACACGACCTCCCTGCAGAGCCCTG
TCCACCCAGACACTCACTCGCCTCCTCCAGGAAGCCTTCCAGGGCTGCCT
CGCCCTGGTCTCAGCAGGAGACAGAGAGAGAGGGTGGGCCCAGGAGCAGA
GGCAGGCAGCCAGAGGGGAAGCCAGGGGCCCTCACTACCCCTGGGGCC
Contig 68 (500 bp)

TTTGCATTACAGCTCGTACCCGGGATCCTTCCCGGGGCTCTGGGGGTGGG

FIGURE 6, CONTD.

GGAATGGGGGTGAGAGGCAGCTGTCATCTGCCTGTCCTACCTGCTCTCAC
AGGCTGGCCCTGGAGCCCTGGCCTCCTCCTAGGGGCACATCAGGTTTGG
GGGAGGCCAGCCACCGTCCACCTCCAAGACCACAGCTGGGAGCCTGC
CCCCAAGCCTAGACCTAGTGGGGCTCCTGCCAGCCAGGCCCCACCTTC
ATGCTGCCACCCACCAAGGTGGGACAGTGCAGCCAGGACATCCAGCTTCT
GGAGCTGCCCCAGGCTCAGCACAGGCTGGTACCCTAGGGAGCAGGTACCC
CAGGGCCGCTGGCGAGGCTGCGGGGACGGGGGGTAGGGTGGGCAGCAA
AAGAACCTCTGAGCTGGGCCGGCGGGGTGCGTGAGGGCCCGGGCCGCG
GGCTGTGTGCGTGGCCCTGAGCCCGTGCAGACGCAGACCCTGGGTGGGT
Contig 69 (550 bp)

TGTGCTGCTGTGGCTGTGGTGTAGGCCGCCAGCTGCAGCTCTGATTGGA
CTCCTAGCCTGCGAACCTCCATATGCTGCTCTAAAAAGACAAACATAAAA
TAAAATGGGTGCGCTGTTAATTTGAACACTCTGCCTCCTCCAGAGACGAG
GCCGAAACAGGCCCTCTCTGAAGTCCCACCTGGCAGGGAGGAGGAGGCCA
GCCCCGTGGGGGGCAGAGAGAACCCCGATGTCCCCAGACACACACGCACA
GGGACCGTGGCCCCGGCTGCCAGCCCCGCGGGGGAGGGCAAGGCCAGAG
ACTCCCAGCAGCCACAGGACCTTGGTGGCCACAGGACACAAACACAGGT
GACGGTGGGTGAGGCTGGCCTTCCCCCCCCGGGCACGAGCACAGGACA
CACAAGAGCCCCAGCGTGTGACCGCCACGCCAAGGAGCCTGGATGAAGC
TGGACACCGAGAGTCCACACTGTGTGATTAGGCTGACGTGAAGTTTAAGA
ACAAGCGGGTGGCTCAGCGCTTGAAGGCCAGAACAAGGCCGGGAGGGCAG
Contig 70 (1300 bp)

ATGTCAGGATAGTAACCTGGGGTGTGCTGCAGTGACAATGCCAGATCCTTAA
CCACTGTGCCACAAGGGAACCTTACCTAGCCTAGAATCCTATACCCACTGCA
AATATATTTCAAAAAAGGTAAAGTCTGAGCAGAAAAGCAAAAATGGGAT
AATTCATTTCTGGAAGACCTTCTTGTAAAGGAAGTTTTTGGACGTGA
TGAAGGTAGAACTCGGAGGCACACAAAGAAAGAAAGAAAGAGACAC
TGGAAACGGAGCAAAATAAGGTAAAAATAAGTTTCATCTCTTCTCATTT
TTTAATTGCTCCAAAAGATAGCTGACCTCTAAAGTAAAAAATAGTGGA
TGTAGCATATGTCTCTAGCGTAATTTAAAGTATAACTTATAGCAATGATA
GCCCCAATAAAGGAGGAATTGAGAATATACAGTTGCTGTGTTCCCATTTGT
GGCTCAGCAGTAATGAACCTGGCTAATATCCATGAGGATGCAGGTTCAAT
CCCTGGCCTCACTCAGTGGGTAAAGGATCCAGGGTTGCAGTGAGATGTG
ACGTATGTCACAGACGTGGCTCGGATCTGGCATTCTGTGACTGTGGCTG
TGGTGTAGGCCAGCATCTGCACCTCCGATTGTACCCCTAGCCTGGGAACC
ACCATATGCTGCTGGTGTGGCCCTAACAGACACAAAATAAAATAAAATA
AAAGAGAGAGAGAAATATACCATGTAAATTTCTCACATGACACAAAGAG
CAATGTGATATTATTTGGTATATGGTGATTGATTCAAGATGTATATCATA
ATATTGATTCAAGATGTATATATTCCTTTTCTAAAAAAGAGATTTATACA
ATAAGGCAAGAGTGAAAAATAAGTGGAATGCTAAAGAATAGTTAATCCAA
AAGAAGGCAGAAAAATGGGGAAAAGACATATAACAGATGGAACAAATAAAA
AAGAGCTAATGAGATTGTAAATTTAATCCAAACATACAGATAATCCCAT
TAAATTTAAACACTCTCAACACATTGATTAAAGAAATTGTCAAATTGAA
TAAACAAAGCAAGACCCAACTAGATGCAGACTATGAAAAACCCACTTCAT
ATAAAGACATGGGTAGGTTTAGAGCAGAAATGATGGGGAACCATGTACAG
CAAACATTTGTCAAAATAAAGCTGGTGTGGCTGTATTTCATCTCAGACACA
GCAGACTTCAGAACAAAGAAACACTGCAAAGGATGAAAGAGATACTGCATA
ATGATAAAGGGATCAATTTTCCAAGTGCAGGCTCCAAACAACAGAGGTTT
Contig 71 (500 bp)

ATGACCTCATACTGAATCGAGCTCGGTATCAGGGGATCTCTCAGCTGGGG
GGGAGGGCAATGGGGCATTTGTCTGAGGATGCCCCAGGGCAGGCCATTG
GCTGGTTTGGTGCCCATGCCCCCCCCACACCCCGCAGTGCCCCCTGCTG
AGCCTGGGACCCCTCTGGGAGTTAGGGATTGGGGGTGGGAACAGGCTT
TGCAGTAATTCCAGCCCCAGGGCCCTTCCCTCCCCGCCCTCAGGACCCC
CAGCCCCGCCCCACACAGTCTCCACTGTGACAGCCTCACCCCTTGGGTCA
AGTCTGTCTCTCCGGCCCCCGCTGGGCAGTGGAGCCAGCTAGGTGAGA
GGCAGAGGCCACTAGGGCGGTGGGCACTGCTGAGGACAGAGGGGCTGGG
TGGCCTTGGACGAGGCCAGCGACGCTGAGACAGTGAAGCAGGCTCCAGG
CTTTCCCAGGGAGGGTCCCTGAATGTCCACTTCTGTGACATCGGGTGAC
Contig 72 (550 bp)

AAGTCCATTAGGGAAGGGATTTGTGCAAACACAGAGACAGGTGCAGGGCT
GGGCCAGCTGCTGGGCTGGGGGCTCCTCAAGGCGCCGTAACCCCTCCC
TGCCAGCCGCTGCCCAAGGTCTGCTGTCCACCCCGCCGGGCTGCTG
TGTTCGGCGGTGTGTCTGCGAACCCGACTCCCGTTACCCCTGAGCAC

FIGURE 6, CONTD.

TGCCTGGAGGCCGGCTGCCAGGCGGGACGGGCCCTCAGGGCTGGGCTGG
CTCTTGGCCTGTGTTTTCATTTCTGAGCAGGTCTTCTCAGTGGGGGGGC
CTTGGGTGAAGCAGGCATGTGCACCACTGGGGCCCTGTCCCCAGTGGGCA
TCCTGGGCGCTTGTCTGGCCCCCAAACCCCCAGGCCGTGTGCATCATACC
TTCACCCTGAGCCCCAGCCGAACCCCGGACATGTGCTGGGGGACCCTGGG
CACAGGGGTGAGGGAGCAGTGGCCTTGGTGGAAAGCCCAGCCTTGGCACCT
GGGGAGGGGTGCATCTGGCATGCTCTGCTGTAACCAAGCCCAGGGCAGG
Contig 73 (950 bp)

GACGTGCAGTAGCCATGACCTCTACGGCCCCCACTGACCAGCCCGTGTCC
TTGTCCCGAGACCGACCCCTAAGCAATAGGATGCAGCAGAAGTGACAGAA
CGGCCTCCGCGATGAGGTGCGAGAGGGCTCTGGCTCTGACTCAGGCCCT
CATCCCTCGCTCTCCTGGAGCAGGGCCAGGTAGGGGCCCCCAGAGACGC
CCTAGAGGAGGTGACGGGCAGCCAGCCCCGCCAGGGAAGGCCTGGGGAC
ACCAGGGAACAGAACGGCACAGGCTCCTGGCACAGTCTCCAGGAGCCCC
CTGGTGGCACAGAAATCTGACCGGCCAGTGGAGGGGGCTGGGGCGGGG
CTCGGGGAGGAGGGACTGGGTGAGGCCGTCTGACTCCTGGCTGAGCGCCG
CATACTTGCTGCCTGCCACGATGCCGGGCCAGGCCTTCCGCACGGACCC
AGGCTCACATTGCGCCTACATGCCACTGTGTGGGAGTTTGGGATGGTGTG
CCCGCTGGGCCCCGGGGTTCAGGGCACGCTTCCCAGAGGAGCGGGTTCCAG
AAGGCCCAGGTGGAGAGGCGATAGGAGGGCTCCAGGGGGCTTCCCAGGCC
ACCTGCGAGGACCCCTCCTGGGGGGAAGGGAGCGGAGGGAGACAGCCGGGT
CCCTTAGGCCAAGGCTGAGTTGTGACCGCAGGGAGAGGAGAGAAGGAGCA
CCCACAGCAGGGCAGGGGCTGCGGGAGGCTGTGCTGGGTGGCCGGGTGGT
GGGTCTGGGGGCCAGGACCGTGGGAGGCCTCGAGGGGGGAGCAGGCACGG
GAGGGGGCCCTGGACGGCAGAGTCCCTGCTCCAGCTGCCGCCCCGACCCC
AGGTCCACCTTCATTTACAGCCTGGCCCCCGGCCGCTCTGACCGGCCCT
GCCATGCAGGTGTAGCGGGCAGTGAGGGCCAGGCTCCGGCCGTCCCAA
Contig 74 (450 bp)

GCAGGCCTGGCAGCAGGGAAATGATCCAGAAAGTGCCACCTCAGCCCCCA
GCCATCTGCCACCCACCTGGAGGCCCTCAGGGGCCGGGCGCCGGGGGGCA
GGCGCTATAAAGCCGGCCGGGCCAGCCGCCCCAGCCCTCTGGGACCAG
CTGCGTTCCCAGGCCGCCGGCAAGCAGGTCTGTCCCCCTGGGCTCCCGTC
AGCTGGGTCTGGGCTGTCTGCTGGGGCCAGGGCATCTCGGCAGGAGGAC
GTGGGCTCCTCTCTCGGAGCCCTTGGGGGGTGAGGCTGGTGGGGGCTGCA
GGTGCCCTGGGCTGGCCTCAACGCCCGCCGGTCCCGCAGGTCTCACCC
CCCGCCATGGGCCCTGTGGACGCGCCTCCTGCCCCAGGCTGGGCCCTTGC
TGGCCCTCTGGAGCACCCCGCCCCCGGGCCCAAAGCCTTTTCATGAACA
Contig 75 (1363 bp)

CCTCCAGCTGGGCCCCGGCAGGGCACCGTGCCCCCTCAGGGGACACCACGGG
GGGCCACAGTGGCCTCTCCTGCTCCAGGCTCTGCTCCCGCCTGGGGCCCC
CTGGGCGCCGCCCATGGCCAGGGCAAACCTCCAGTGCGGCTGCCCGTC
TGGGCAAAGAGGCCGCCAGGCCCGCGTGGTCTTAGCAGGCACTGGCGGA
TGCCGNTAACTAACCATTCTTCCGCAGGAGTCCGAATCTGCTCTGACCA
CGGGCCCTAAAAATCGCTCCTGGCCCGCAGAGGATCCCCGAACAGCGGGG
CTGCCTCCTGCTCCTCCTGCCGGGCGCGCACTCGGCAGGCACGTGCCCTC
GTCGTCCCCAGTCTGTCAACCGTCCCGTCGTTACGATCCCCAGAGTCCCA
CGCGCGGGCAGCTCTTCCACACCCCGCACGGCCCCGGAGCTGCCTGGGC
ACCCAGATCGCCCCCTGACGCCCTTGCTCCTAATTCTGCTGAAATACACAT
AACGTCTCCTTGAACGTTTGTCCATTTTACGGGGACAATTCTGTGGCCG
TAGGTACACTCCCCCTTGGGGCGCAGCCATCGCACCATCCGCTTCCAGGAG
GTCCCGTCTGCCAGATGGACACTGTCCCCACTGATCCCTAATTCCCTGT
CCCCCCCAGCCCTGCCCTTCTGTCTCTGTGGCCCTGGCGCCTCCAGGGA
GCCCCCTGTGCGTGGGATCACAAAACGTGTGTCCTTTTGCCTCCGGTGTGT
GTCTCTGAGCATCCGGAGCTTGGGGTGCTTCCACGCTGCGCCTGTGTGAG
GACGTCCTTCCCTTTTGGCGCTGCGCGATGCTCCCCGTGGGGCTGCCCCA
CACTGCGCGTGTTCGCTCATCCATCCACTAAGGCTGAGTTACTTTTGGCG
GTTGTGAATACTGCTGTGTGAACACGGGCGTGCAAATACCTGCTGGAGGC
CATGCTCTTAGGCCTCTCGGGGGGCACACCCAGAGCGGATATGCTCAATA
AGGTAATTCTGTGTTTAGCTTTTGGGGAACCATCAGGCTGGTCTCCAGA
GTGACGGAGCATGCGTCGCAATTCACAGGAATGGTGCTCGAGGCTTTGAGG
TCTCCACCACTCGCTTCCCTATTTTCTGTGCGTCACAGCCGTCCGAACGGC
TGGGTGGTGCCTCTGTGTGGCTTCAATGTGCTTTTTCTTTTCTGGCTAT
GAGGTTGAGCGTTTTTATGTACTTGCTGGCCATTTCGAGGGTTTTTGGG
GTTTCTTTTCTTTTTTGCCTTTGGGGACGGCGCCAGAGCGTATAGAAGT

FIGURE 6, CONTD.

TCCCTGGCTGGGGACTGAATCAGAGCTGCAGCTGCCAGCCTAGCCCACAG
CCGCAGCAACGCA

Contig 76 (500 bp)

TCATGCCATCGCCACCGCCCCACCCGACGTTTCAAACACCAGAACCA
CCCCTCGGGCGGCAGAGAGAGGACCGGAAGGAGAGACAGCCTGGTCCCAA
GGCCTCGCCCGGTCTGTGTCTCCGAGCGACATTTCTTTCTGTTTCCCTC
CTCCGCGGTCCAAGTTTCACCCATCAGAGGCGCATTTGTTTTATCATCTG
AAAAAAAAATCTCTGTCTCTTAATAAAACACAAGAAAAAGTAGCCTTCGA
AAGAAAGCACATGAATGATATGTGCTGGCGACAGTGCTGGCGGCCTCTGA
GCCGTGGTGGGAGGTGGGAGCCAGCGGAGCCCCCTGACCGATCACGTGACC
CACGTCTCTCTGCACAGCTGGCTGCACCTGCACGCGGTGACACAGGGAC
CCAGCCTCCTGCCAGAGGTCACCCACCCCGTCCGTCTCTGTGGAAGG
GGCAGCGTTGCCTTCTGAGGGTGGGCTGCTCTGAGGGGCGCTCTTTGGCC

Contig 77 (626 bp)

GCCATGGGCTGCGGCGGTTACGCGGCTTGCCGGCCTGCCTGGAAGTCCC
ACAGGACCAAGGGGAGGGACGCTCAGCACAGGGGGCCCCGGGCACGGACGG
TGCCCECAGCCGCCCGGCCCGCCCTCCAGACAGGACGCCCCGTACCC
TTGCGGGGACAGCCAGCCTCGTGGCCTCGAGCAGAAGAAGTAGAGTGGG
GTGCACAGGGGCCCCCGGGGAAGGAGAGGGGACAGCGGGGTGAGCGGG
TGCGGGCGTGCTCGGGACCAGCCCTGGCCTCTTGGCGCCTCCCTCCCCG
TCCTTAAACCGGGCCAGCCTCTTGGGCCTCGACCCAAGGCTGTTTGGA
AATAGGTGGACCGTGGCCCTGACCCGAAGGCCAGCGGGGACCCGAGTGCG
GTCCCCAATGGATCAGCAGGCGCTGGGCAGCCTGCGGCCCCGGGACCCG
GAGACACAGGTGGGAATGGGAGGAGGAGGAGGAAGACGGGAGGAGAGGAG
TGAGGACCAGCAGAAACCACGCCCTCCTCTCTTCCCGTCTCGCCCTCGC
CTCCGACAGCTCCGACTCGGCTGCAAGGAAAAGGCCCCAGCCAGCCCGC
CGCCACCGGGGGGGGGGGGGGGGGGGGG

Contig 78 (500 bp)

TACTCGGTTTGTACCACAGCCACAAAGGGAGCTCCTAAAAATAATA
ATTTTCTTAAAGCCAATGACATGGAGAGCAGTTAGGGTGGAGGCTGGTGG
GTGGTGGGGCCGCGGCAGGCGCCCTGAAGGTCTGAGTGGCACCCCTTGGC
CGGGGGAGGTGGGTGGGCGAGGGGTGTTGAGAAGGGGACGGGCTCGTGG
GGGCAGGAAGGAAGAGCCAGTGGCTCCAGTCCCCTGACCTTGCTGCCTT
GAGCCTGGTTCTCCCCAAATTTCTGTCTGTGTCCCTTCACTTCACGGAAG
CTTGGGGCCCGTTGCCAGGGAGACAGATGGGCTGGTGACCCCAAAATGA
GCCACCAGGAGGGGGGCACTGACTTTAGCCAGCCGCTCACATCAAGAAGC
AAACAGGCCCCCGCTGCTGTAAAGGCAGCTTGGGGCTGGGGTCCGGGAG
CACCCCTGGGCTGGGGAAAGGGGTCTCTCAGGCCCCCGGGGAGGATG

Contig 79 (427 bp)

TCTATTGCGCTGGCCGGAAGAGGCTAACCGTACATTGACCGGGCATCTG
GCGATGTATCACTTCTCTCCAACCGAAACTTCCCGGCAAACTTGCTGCG
TGAAAACGTTGCGGATAGCCGAATCTTCAATTACCGGTAATACAGTCATTG
ATGCACTGTTATGGGTGCGTGACCAGGTGATGAGCAGCGACAAGCTGCGT
TCAGAACTGGCGGCAAAATACCCGTTTATCGACCCCGATAAAAAGATGAT
TCTGGTGACCGGTACAGGCGTGAGAGTTTCGGTTCGTGGCTTTGAAGAAA
TCTGCCACGCGCTGGCAGACATCGCCACCACGACAGGACATCCAGATT
GTCTATCCGGTGCACTCTCAACCCGAACGTCAGAGAACCAGGTCATTCGCAT
TCTGGGGCATGTGAAAAATGTCATTCT

Contig 80 (650 bp)

GGCGTTGCCGTGAGCTGTGGTGGGGTCACAGATGGGGCTCAGATCCCGC
GTGGCTGTGGCTCTGGCCTAGGCCGCTGGCTGCAGCTCCGATTTCGACCCC
TGGCCTGGGAGCCCTCCATATGCTGCGGGAGCAGCCCTAAAAAAGAAAAA
AAAAAAGGAAGAAAAGAGAAGAAAGAAAAGAAAAGACAAAAGTCAAAAG
GAGCTCCCTGAGCGATGTCTGTCTACGAGCAGGTCCCTGGGAGCCTGAG
GCAGGGTGAGCCTGGACCCCTGAGGGCCACTCCAGACTCAGTGCTCTCAC
TGGCCAAGGTCTTTGGGGACCGGCTGGGGGCGCGCGCAGGCTAAGGAGGA
GGTCAGAGGAGGGGCTTCAGGCTGCAGGGCCAGCGGCAGCTCTGGGCCCC
GGCGGGGGGGAGATGGCCTGAGGGCCTTGCGGGGCTGGAGGGTGGGGG
GCTTCTTGGAGTGGGAAGACGGGAAGCCAGGTCAGAGGAGAGGAGCGAGG
GCTGAAGCTCCTGGAAGGCGCTGGCTACCCCGAGCTGGCCCCGCCCGCTG
CCACATTCACAGCCACCCGGCCTGTGGTCTTGGCAGGGTCTTGGCAGAA
AAGCCCCAAGGGCCCCAGCCTGGCCCTCTGGGCTAAAGAGCCAAGCCCC

Contig 81 (550 bp)

TTAACCCACGGAGCAAGGCTGGGGATCGAACCTGTAACCTCGTGGCTCCT

FIGURE 6, CONTD.

CGTCGGATTTCGTTAACCACACTGCGCCACGACGGGGACCCCCAGGGCTGGC
GTTTCCCTCTGTGTGCACACAGTGGACCTGAGCCAACCAGCAGGGCCTTC
ACCACCACGGCGCAAGAGTTCGGCAGCAAGAGAGCAGTGTCTCATGGCTCA
CTTTCTCCCCCTTCCCCGGAGTGGTGACAAAACCCCGCCGCCACCGGACT
CGGTTAGACAAGGCGGTGCCAGTGCCCCCGTCTGTCAACCCGCACGGCAC
GGCGCTCTCCTTTCTTTCTCGGGGCTCCACCACGTGTCTCAGTTTCCGC
ATGAGAGTACCACGGCTGGCGGGGTGGTGGCTCTGGGGTTCGGGGGCCGTG
AGGGCAGGGCTGGGCTGGGGGAGGCAGGTCTTGGCCATTACGCGGGGGG
CAGACTCCACATCACACGCTCTCTGTGCCTCTTGGCTGCCTGACACCATG
GACTTCAAACAGGAACAGCCGTGGAGGCATTGCAGCCCAGGGCCCGGGT
Contig 82 (550 bp)

TGACACCTCCAGGCAGGAGGGTGCAGGCTGGGGTCCAGGTAATGGTGTG
CTGGCCTGTGGGGCGTGGGCTCAGCTCTTAGGATGGTGGGCTGGGCGCCG
ACCCAGCAAGGACAGGGTGATGGCAGGTCTGGGCTCAGCAAATGAGTGC
CCAGGTTGTGGGGGTGGGCACTTGGGCTCAGGGGAAGCTCATCAGCTTG
GAGAGGGACGGGGGAGGGAGGGGGCCTTGGCCAGCTGGCCAGATGCCTG
GATGTGAGCACTCACGTGCCCCGGGGTCCACCTCCCCCTCCAGTGCCATCT
GGGCAGGAGGCTCCGATGCCCTGTCCCTGGGACCCGCTGTCTGAAATGAG
GTTCACTTGGTGCCTTCCCCAGAGATGCTCGGTCCGGAAGCTGACGAGGC
AGGAGTGCACAAGGGTCTGGGGAAATGGAGCAGAGTGCGGCTGGGGCACA
GAGGCTGCCCCCAGCCTGGGAAGATGGGGAGCTTTGCAGGGGTACCCCGC
CAGCTTGTGGGGCCCTGGATACCAAGGGTGTGAAGAGGCTGAAGAGCGA
Contig 83 (984 bp)

CTGAGCCCAGCTATGTAGATTAGACCCCGGTCCGTCCCAAATTCTTCTCA
AAGCTGTCCCGAGATGAGAGATGAGGTTTTCTGTCTCTGTCTCTCTCG
CTTCCCCTGGGATGTGCCCTAGGGTGGGAGAGGGTGTGTCCCAGGGCTCA
GCAGGGCGTCCCCTCTTCCCGAGACGGGAGAGATCCCCCTCTTCTCGGCG
CCTGTCCCCACGGCCCCCACAGACACCCCCCCCCCGGCATGGCACCCAT
GCACCTGCCATCGTGCCAGTAGGGGATGGGTTTGGCGAGACTGGAGATG
GCTGTAGCCAGTGAGACATGCCCTGCCACGTAGCCTGACCCCTGGGTGT
GCTCTGTGAGATCTGGGGACCCCCAGCACACCTAGGGATCATCTTGCCA
GCCTCTGGGGAGCCTCTCAGAAATGGGGGCCCCAGAAGGCTGGCAAAG
GTGATGGGGAGCGTGGGAAGTCTGGCGGTTGGCGGGGTGGGTGGGGGGCA
GTGCGGGCTGGGTGGGGGGTGTCCGGGGTCCGGAAGTGGTCCAGCAAGGT
TTTGGACACAAAGTCAGGAGGAAGGAGTGACGAGGAGACTTCAGAAATTA
CAGGTAGAATCAGGAACCCACATCGACGCCAATTGATCTATCCCCCCTT
TGATTGTTTTCTCTGGGGCTTTTTTCCNTTTTTTTTTTTTTTTTTTTT
TTAATCCCTCCTTAGCTTTTTACGCGCTCAACACCAAATTAACGTAATC
CCCACCCACGTAACAGGGGGGCGGTGACCCGAAGGACGAGGAGCACACG
AAGCCACCATCCGTCACCTTGGCGGCACACGCGCTGTCTGCCCTCCGC
CCATTTATCGCCCTTGAATTGATTTTTGTTTTGCTGTCCCTGTGCTT
GGGTAGAGTGGAAAAGGGAACCTCTGTGGGGGTGCCAGCCACTGGGCCCC
CCAAAGATTTAGGGGAATGAAACGGCTGCCGCC
Contig 84 (550 bp)

TGCCCTGACAACCTGCCCTGTAGCCACACTCGCGACTAATAAGGCGA
GAGGTCAGCGGGCAGCCCCACGGGGAGAAAGTGCTCCGTGCCCCCCACC
CTGGCTCTGATGGCCAGCCTGGCACCCCAAGGTGGCTCGGCCTTCCT
ACCTCCAAGGTCCAGGCGCATGTCCAAGCACAGCAGAAAGCTTCTCCAGG
GTTGGTGCCTGCTCAGGGCAGAAAGCAGGGGTGAGGCTCCCCAAAGGGCC
ACTGGCACC AATGCCCCAGGCAGCCCCAGCGAAGGGGACAGCCACCCC
CAGCCCCGGGACGCAGGCCTGAGGGGACATGGGGAACCCAGAGCAGGGCC
AAGGGGAGCAGAGCCCCCTCTCCGGGACTTGAAATCTTTCCCGGGGGCC
CAGGGAGCTGGGGTCTGCAGAGGGCACTTCAAATAACGGCCACCCCCA
AATTGCCACGTGGGCCACAGAGCAAGGAGTCTGCTGCCAAAGTGGCCTGGC
TTCAGCGCAGGAAGTTCCCTCCTGGGGCCTCCCTCCTATAGGCACAGG
Contig 85 (500 bp)

TGAGCCAGGGCCTGGCCCAGCTAAGCCCCCTGGAGCCCTCCCGGCCTGTTT
CTGCTCCCATGCTGGCGGAGCTCGGCTTACTGAGCGGGGCCAGGCCA
GTGTGCGTGTGGAGGTAGATTCCACTCAGCTGGAGGTTGAGGTGGGCAGG
GGGCCGCAGACCCTCAGGCCAGCTCTGGCCGGCCAGGTCCCTGAAGCTCC
CCCGGCTGGCCTCCCCGTCCCTGCCTCTGGCCTTGTCTGGCCCTTGCTT
GACAAGCTTCTGTGGCTCTGCCTGCAGGAGAGACACTGGCTCCCCCGCTC
TCGGATGAGGACGGGGCTTTTCTGCACAAGTCTGCCCCAGAATGTTTGG
GGCGCCAGCAGCTGAGCCCAGCACGTCTCCCCCTGCCCTGGCTGGACAC

FIGURE 6, CONTD.

GAATCCCGGCATCGAGGCGGGAAGGGGGATGGAGGGATGGGGCCTACCCA
CCCCTGCTCCCCACCCAGAATAGCTGGGCGGCCCCCATGGGAGGCCGCCC
Contig 86 (913 bp)
CTGTTTTACGTCTTCTGAGGACACACCCAGAAGAGGGGCTGCAGGCGCC
CATGGTGACTCCATGTGTTCACTGCTGAGGCCTCTGCAGACCGTCTCCCG
CAGCAGCCGCACCCGTTTCCATGCCACCAACAGCGTGCGAGGCCGCACTG
TCCCCACGGCTGTGCAACTGTTTTGAATCTGAGTTATATAAGCAACAGAC
GCTCCTTCAAACACACTCACGTGCACACGTGCGCACAGGCGCACAGACAC
ACACACGGAGTAATAGGCCTCCCCCCCCCTCCCTGAGCCCAGAGGGGGCCT
GGGGCCCTGGAGCCTGTGCTTTAGGGCCTTTTAGGAAAGCTGGTGCCTCC
CAGAGGGGCGCCCCGAGCGTTGGCTTCCCAAGTCCCCACCAACCTCGA
CAGACTCAAACGTTGGTTTCTTTCGTGCTTTTGCCCAAGGGATGGGCCCCG
AGGTGGCCCTGCCTGAGGTTTCAGCCCAGCGCCCCAGGCACCTTTCTCT
CCCGGTCCCCGGCCACTTCATGGGACAGCGGGCCTTCCCCACGTTGTCC
CCTGGGTTGTGCTGCTTTTCGTAATGAGACGGAGGCAGGTGCACCTGTCC
TGGGGTGAATTCTCTTCTGCAGGAACCTCGCTTCCCCGGCGCCTGGTCTGT
CTGTTCCCTCGGTTGTTGGAACCTCTCGTCACCAGAAAGGGTGGCTCTGAC
GTCGCCCCTTTCCCTCCGTGGCTTTTGCAGTCTGGGTCTTGTGGGGAACC
TGCCCCAAAGAGGGGAGTGACCCCCACGAGGGAGACGTAGCTCCTGTGG
CGACAGCACCGGGGGCCCCCAGATTTCATGGGGTTCACGCTCACAGTCGCA
TGACGCTGCCTTTGGACGAGGGCAGCTCAAGGGAAGCTTGTTCCTGCCA
CGAGCCACAGGCA

Contig 87 (650 bp)

TCCACACCTGTGGAGCCGCTGCCTCGCTGATGCCCTCTGCCCAGCTGATG
GTCAGGTGCCCAGACTTGGGGCTCAGTCCAAAACAGGGGGCCACAGGTGCT
GCACCTGGGCAAGGGAGCCTGTGCGCAGGGCCTCAGGTGTCCAGGCTCG
CTGGGACCGAAGCGCACTGGGTCTTGGACTCCGGGCTTCCCCAGGGGCTG
CTCGGGGCCACCTGGAATGAAGCCCCACCTGGCTCATAGGGTCCACGTG
AGGGCCCTGAGGCCACCAAGCCACCAAACTCAGTTAAGGGAGGGGAG
CTTGGGGCTGCTAAGCTCCAAGCGGGAAGCGGCCGCACTCAGCACTGCCT
CTCTGCCAGCCAGCCGCCAGCTTGTGACGTCCCAACCAGGCCAGGGAC
CCTGTCCCACAGATGCTGGGCCCCTTCAGTCTCTGCTCCCTGGAGGCGCT
GGGCACTGTGTGGGCACACAGCCCGCACCCGCTGTAAGGAAGGGAAAGG
CCCCATCCTCAAAAAAGCCGTGGGCAGGTGGGCCATGATGGTCTCCGAG
GCAGGTCTCTGGGACCCCTTGTCTCCTCGGGCTCGCCAGGAGCCGCC
AGGTCTGCCCTGGATTAACTCTGCCCCGCATGTATTTCAAACCTGGCTT
Contig 88 (700 bp)

TGGGGCCCCTTTGGGGCCGGAGCGCCAGTCTGCT'GGGGCCCGGAGCAGGG
GGTCTCTGTCCGAGGGAGGGGCCCTGGTCTCAGGGGAGGAGAGGAGGCA
GGTCTCACCTGAAAGGATCTGCC'TTCTCCTCAGGCCCTTGGGATGCCTGG
GCAGAGAAACCAGAAGGAAAGGCCAACTTGCTGGCTGGTGGGGATGGGG
CCGGGGGTGCT'CCCGGCACACCCCCCCCCAAACCCACCTTAGTGGCCAA
AGTGGGTGTCATGATGGCCACTGACCTCACGGGGGCGCAGGAGACAACAA
AATTT'CAGCCACTCTTGGGGGAAGGACACTTGTGGCCTGAGTCTTAGGGG
CTGAGTTTTCGGGGGGGACCCCCAGCTCTCCCCCAGTATGAGACACCCTG
CCCCTCTCCAGCTGCTCCCCAAACCCAGTGTCTTGGACGGGCATCT'
CCCCGCTGCCCTGCAGCCGCTGTCTCTGACCATGTCCCTCCCCACCT
CCCCCTCTGCAGGGCCAGGCCTCCAGGGAGCAGAGCCGAGGCCACCCCTA
GACTGAGCTGGGGACCGAGACCCCAAGTCGCCACCCGGTCTCTGCGTTAG
AGAGGGGGTTCCGGGGGGCACCTTGGGGCGGCACTGGGGGGCGGGAAGGA
GAGCCCTGGGGCTTCTGGGAAAGGTCTGGGAGGGAGGGAGGGGTTTTGC
Contig 89 (1400 bp)

GCACACCCGGAGAACAGAGGGAGGGGTCTTACCAGTCTCAGGGTTTTTT
TGGGGATTTC'TTGAAC'TTGCCCTATTGGTTTCGAGGCTTCTGTTCTCTC
CAATCCCCCTTCTGAACCCCCCAAAATGGGTTCAGCCCCACCCAG
CCAGAGGAAACCAATTGGGGGATTGGGGGGAGGCGGGGCCAGCAAAAGCC
TTGGGGCCCCAGCCCCCTGGCTTTGGCCTCTGGCCTGCCAGGTAGGGGG
AGGGACGCGGTGACCTCCGGGGGCCCTGGCCACGGACTCTGCCCCACCCC
CAGGGCAGACGTGCACAGGAGGGGAGAGGC'TCCGAGGAATGAGGCCATCA
AAGGGACAGGTGAGGCCACGAGCCGTGGGACCTGGAAGTGT'TAGGGCCT
GGGGGACGAGGTGCGGCCCTGCGGGCTCCGTGGTCAGGAGGCCCTCTGCC
ACTGAGCAGCTCCCACCACTGGCACACGAGCCTCTCTGGGGTCCGGCTG

FIGURE 6, CONTD.

GTCTCCGGCAGGGGTGGGCTCTGAACGTCCAGCTCCGCAGACAAATCAGA
TTCCCCGAGCCCTGAGAAAGCCCCCTCCCCAGCCCGTCTCCCCACCTG
TCGGTGGACAGAGTGACCCCTGCTGACCCCTGCCCGGGCTCCCGCAGGA
GATGTGAGAGAGTAAGAGGCGGTACAGGACGGCCGGGGCGGGCCGGGCGA
GGTGCAGGTGTGTGGGTGTGAGGCTGGGCACAGGCTGGCACAGCCTCCCT
GGCCACAGTCCCTTGGGCACCTCTGGGCACCTCGGTGTGCCTGCCTCCTGA
AGGGATCCACCCCTCCAGCCACCTCCTCTCGGGCCAGCCCCACCCACCC
CCGAGCTACAGATGCCTGCGCATTGCCCCAAGTGTCTGGACCCCTGGAG
CCAGGCAGCCCACCCGCTCAGCCTGGCCAGACCCAGCGTTGCCCTTCACG
CCCTCCTCCCTCCCGCCGGGTCTCGCGCTCGTCTCCTCAGGTTGGAAGC
CCCTTCCACCTGCCATCTTGCCTGCGCCCAGGATACACGGCTCAACTCA
AGGCCTCACTCCTCGCCCTCTCCAAGGCTCTGTCCAGGCCCTCTCTGAC
CTGGCACCCACCTGCCGCTCTTGGCAGCCCCAGCAAACCCCTGCCACAG
TCCACGACAGTCTCTTCTGGCTCTGCCCCCAGGATGCTTCTAGAACTGG
GGGGGGGGTCTTCCAGCCCACGCAGCATCCACTGGGCCCTGGGCTCCCT
CCCCAGGTGCCCTCAGAGCTTGAGCTGGTGCAGACGGCTCTGCTCCGA
ACCCATGCTCCCTGCGCCCTTGGACCTGGTGAGATGTTGCAGGTCAATTG
GCTGCACCCAAAAGAGTGGCCCCCTCAGGGTCCCCCTGCGCCCCCTCCATC

Contig 90 (350 bp)

GTA CTGTAGGGCTCATTCGAATAGCCTACTAGGTCACAGCTGATCCACA
CCTTAGGCCATCACAACTTCCCAGAGGTAGTGCCGCTCCTGTCTTGAAC
AAGACGGTAGTGACTGCTGTGAGAGCTCAGATCTGGTGGGTCACTGACCG
AGTGTGGAACCTGGGGGAAGGCTGTGGGGTGTCCCCGGCTGGGTGGCCA
TGTCATGTGCCCCCTTCTATCCCTTGGACGAGGCTGGTTCACTCGGCTCT
AGAGCCCCAAGCCCCAGCTGCTCTGCCAACCCCCAAGCCTGAGCCTCAT
CAGACCCACCACCCATCGCCATGGCTACGCAGGACACACCGCTCTCCAC
CCCCACAGCCGCCCCACCTCCCCGAGGTTCCAAAGCTTGA

Contig 91 (1464 bp)

TCCAGGACCTGATGCAGCAGCCACGTCCGGAGGCCCCCTCCCACGAGGCC
CTTGTTGACCAGCGTAGGGAAGGGGACCAGGGAGATGCTGAGAACGGG
CCTTCCGAGGGGGCAGGTGGGACTGACTGTGACCCAACTCCCCACCC
CCTCTCCGCTCCAGAGGTGCCAGCCTGGAAGCTGGCAAAGTCCAATCC
ACAGGTGGGCTCACGTGGGGAGGCTGGTGGCCCCACCTGGTGGGGCCC
AAGCTGCCTCTGGGCGGGTGGGGGCTGCTCCCAGCAGGCTCCATCCAG
CTTCTCCCTGGGGAGACTCACAGTTCTGGGAGAAGGGTCTGACTGCACC
GCAGCGCCCGCCCCCTCCCCAGACTCACCCAAGTTCTCTCTGTCATCGG
TGACTGGTCTCCGCATTTGCCAGGCTGGGCATCTGCCAGAGGATACGT
CCAAAGGCAGGGCAAAGCCGGGCCGTCCCCCGAGCTCCCCACAGGCGC
TGAGGGCTGGGCTGGATCTCGGGGGGGTGGAGGGGAGGACTCAGAAGGTG
CAGCGGGGTGGAGCGAGGCTGAGCCAAGGTGCACGCGAGGGCCAGAGAAG
GCCGAGGCGGGCAGGAGGAGAGAGCCAGCCTGGAGGGGGGTGGGTGCC
CTGGGCAGGTCTGGGGCTCAAGAAGAAGAGAGTGTGTGTGCAGGGGGCTG
TCCAAGCTGCCCGGGAGGCTGCCTGCCACCTCCAGGGAGCAAAGCAGGG
AGGCTGCAGCTGGCCCGGGCCGGCCGCTCTCCAGGACCACGCGTGGCCAG
GCCTCAACGCTCCTCCCACAGCCCAGGAGACCCAGGGCACCGGTCCATT
TACCGCGGGCTCCGGGTCCGTTTGCTGCGCCCTGGGATGGACTGTGGGG
GCGGGGCGCTGTCTGGGGAGGAGGGAGGTGTCTGAGGCTGGACACCTTGA
AGGCAGGTGAGAGTGACAGGTCCGTGCGCAGGAGCCTTCGGCTCTGGATT
CTGGCCCTGAGCGAGGGGGCTGGCTGGAACCTGGGCCGGGGCTGCCGAGG
AGAGTGTGCAGGGAGAGGAGACGGGGTTTGGCCCCGAGGTGCCGGGGTG
GTGCCCTGGAGTGCGGCTGAGCGGGAAGTGGGTGTTGGCGTCTGGAGACG
GGGGGTCTGGGCTTGGGATGGTGACAAGACCCCCAGGTGGAGGCGGCC
GCAGAGGAGGCAGAGAAGCCAGGCCCCAGCCCCACGGCGGGAGGCCTGGG
AGTCAGGAGGGACAGCAGAGCCCTGGGCTCAGTGTACCGGTCTTGGCA
CCTCGCCGACGGATGTCTGGCCGTGCAGTGGTTGTCCCTCACCTGAG
CCCTGAGAACCATGCAGGATGCTGGTGTACAGCAGGAGAGGGCCAGGGC
CTGGGGAGGAGTCTTACTGGAAGGCCTTCTCCTTCCGTTTGCAGCAGGCG
GGAATGACTGGGGG

Contig 92 (694 bp)

TGGAGCCAGGGCACGGCAGAGCGGTCCCGAGGCCGTGCGTGCTGACCCGG
GGGATGGGCGGACCTGGGGGTGGGCTGTGAGCCCAGGCATAGGGACCCG

FIGURE 6, CONTD.

ACTTGGGACAGGCCAGGTGGGGCCGGGCAAGGGGGAACAAGGACGCTGGC
CTCCAAGGGCCCCACGTGGGCACAGAGGAAGAGCCGACCCAGGTGTGGG
CGCATGGAACCCCCACTCTGGGGGCCAGGAGCCGAACGTCCCAAGGGC
TGAGGCTGGGAGGGAAGAGTCCCTTTGGGGGTCAGTCAGTGTCCCTTGTG
GGTGCCCCCTGCCACTGGCGGCACCTCTGACCCCAACTCCTTGCGGGTG
GACGGTGGATGGATTTCCTGCAGCCTTCTTCTGGAATAGTCTCTGCCAT
CCTCGGGGAAGCAGTGATTGCTCTGCCCCAAGTCCAGGCCCCGCCCTGCAA
GGTGCCCTCCACCCCAATGAGCCCCCGGACAGTTCGAGGGCTTCTCACGC
TACTGAGGGGTATGAACAGCTGTCCCCCTCGGAAAGTGGGGGACAGGCC
CTGCCACTCCATCCTCGGGACGCCGGTCTAGTCAGCACTTGTCTCCCTG
CCTTGTGCCCCCTGACCTTTTGTAGGACCATCAAAACCTCAGCCTCTG
CCCCAGGAGGTCAAGCCCCCGTCCCCCAGCCCCAGACCAGCA

Contig 93 (900 bp)

CCAGCCCCATCCCCCGGTGGTCCCCCACCACACAGAGCCCCCGTTTCCC
AGGGGACAGCACAGCCTGCCCCAGGTCTTACATAAAGTCACCTTCTCAG
AGCTCCTGTGCGGGCTCAGGGGAATGAATCTGACCAGCATCCATGAGGAC
ACAGGTTTGTATCCAGGCCCGCTCAGCAGGTTAAGGATCTGGCGTTGCC
GTGAGCTGTGGTGGAGGTGCAAGACGTGGCTCAGATCTGGTGTGGCTGT
GACTGAGGTGGCGGCCAGCAGCTGCAGCTCTGATTGGACCCCTAGCCTGG
GAACCTCCATATGCCGCGGGTGCAGCCTGAAAGGACAAAAATAAATAAA
TAAATAAAGAAGTAAACACACCTTCTCTAGCCATAACCACTGCCTAGG
GGCGGAGGGCCAGGAAGCGGCACCCCCCGCCCCAGGCTGCCCGTGCGCCC
CGGGCAGGGCGGCTCAGCCTGCTTTTGTCTGTGATGTGAGCCGCCCCAGC
CCCACATGGAGGGGCTGGGCTGCGCAGTAAGTCTTAACTGACGGGAGC
TTTCGACCAGCAATTCACCAGCGGGCATGCAGCCGGGAAGGAAGTTATTC
GTGTGTAGCTATTAGGCGCCGGAGTGAGGGTGTGCCCTCGCCCTGGGCCCCA
CCCCTGGGGGGAGGCATCACAGGGGTTTGAACACCTGCCCATGAACACG
GGGCAAAAGCCAGCCAAGGGGGCAGGTGCCCTGAGGCTGGGAACCAACCG
TGTCTCTGAAATCCGGGGAATGCCCACTGCAGGCATGTTCAAAGGGTCAA
GACCGGGGCTCTGCCTGAGAAGGACTGGCGAAGGCCAACTACAAAAGCGC
ACCCCTCTGTGCAACCCCCAACCAATGGAACAAAACCTCCAGAGGGGCCA

Contig 94 (550 bp)

AGTCTGGGCTGTGTCCATGGGGTTGCCAAGGTGCCAGGCAGAGACCTTGG
GGCAAAAGGTCTGTGAGCAGAAGGACATGGCCACGTCCCTGCTCAGCA
GGTGCCCAGGCTGGGGTCTGATGCCCTCGCTGGGGTGGGGCGGGTTGAG
GGGCCAGGCCCAGACACCTTCTGTCCTGCCGAGTTGTTTGCCTTCTG
TTCTTGAAGGCCCCCCCTGCAGGTACAGGAGGCCCTGGGGCTGACGCTG
CACCTTCTGACACCTGTGGTCTTGGGGATGGGACAGGACAGGGAGACCCC
GGGCTGGACGGAGCGGGTAAGACAGAGAGTTGACTCTGTCTCGAGTCT
GTGCAGGGCTGTCCCCGGCTTGGGCTTCGTCTGCAGGGCCTTTGGGTCA
GGGTGGCCTCAAGGTGACGAAGACCTGGTCTCGGGAGTCTGCAGGCGCA
AAAGTTGGAGGCCACCCCCCGGGGAGGGGCGCCAAGGACAGGAGGGCC
CAGGGAAGTCTGGGGCTGCAAGGCCGTCCGGGTGGGGAAGGCCAAGGT

Contig 95 (1200 bp)

GTTTGTCTCAGCAGGCAAGGGCCTCCGAGGCCTTAATAGCCCATATGA
CAGCGCCCGCTCCTGGCATGGGGCCCCGCTGGCATGGGGCAGGGCAGGG
CAGAGCAAGCAGCATGCAGCTTCTACCTTCTTCTGACCTCGTGGCCCCCT
TCCGAGGCCCTCAGGGGTTCCCCGAGTGGGACCCAGCCCTGGCTCTCCT
CTCCAGAGCCAGGCCCAAGGCTGGGAGTGGCCAGAGATGAGGGTGCCCG
AGCAGGGCACTGCCTTGGCGTCCCCATCCCTGGCGCCTCAGGGCCGTACT
GTCCAAAACCAAAAGAAAGCAGTCAGCAAAACTTCTCCAGCAAGCTGGG
GTCAAAGGTGCTTCCGAGGCGTGATCAGGGTGGCCTTTGCTACTGTAC
CGTGTGCCCTGGGAGAGGCACAGGGACACAGACACACCTCCGAGAACC
TGGGGCTTCCAGGGCGTCAGGCTGCCTGGGCCATCCCGGGCCCCCTGTGGT
CCCAGGATCTGCCGGGACCGTGAGGCTGCGTCCCACCTCTGCTGGGA
CAGGCCCCACAGAGCTCACAGCCAGGGGACCGGGGACAGGGCCCCCGCTG
GGCCACCTGCCTCCAGCCTCAGGAGCCTGGGCCCCAGGCTGTGCCTGC
GACACCTGAGTCTCAGGACGGGCGCGGACAAAGCCGCCCGGCCCTCC
CCCGGCTGGGAGGAGACCCGCTGGCCCTGACGTGTGGGCTGTGAGAGC
TGAAATGTACAGCAATTAGCCCTAACGAGGCCGAGGGAGGGAGCGCGG
GGAGGCCCGCGGAGGGGATCCACGAGCCGAGGGCCCGAGCTGGCCACCC
CAGCGGTGATTCAGGCACCTCAGGGATAATTGGGTGTTTAGAAGTCAGG
CGGCAGCAGAGAGCGGGCCAGGCGGGCTGTGCCCCCTCCACCGCCCC
TTAACAGGTGCCCGAACACGCAGGTCTGGGGAGATGCTGAGGTGCGCAAG

SUBSTITUTE SHEET (RULE 26)

FIGURE 6, CONTD.

AAGAAGATGCAGGAAATCCTCAAAGTTCAGTCACAAGAAAACCCAATTCA
AAAACCAGCAGAGCAGACATACGATGGCAAATAACCACGAGAAAGTCAGC
ACCCGCTGTCCCTGGGGGGACGCGAGTCAAAGCCAGGAGGACACCAGGAT
ATGCCCACTGCCAAGGCTACGGATAACGGGAAGCAAGAGACACAGACAGA
AAGGATGCTTCGGTGCTGGGGAGGGTGGGGTGGGGCGGGGGGTCCCCC
TGGAGCAGGATGTGAAGGCACTTGGGGGGGGCTCTGCACTCCTGGGGGCC
TTTGGCACAGGCGGAGGGCCCGGAAGGCTCTAGGGGCACGGAGAGGGGT
GCCAGGCTTCCTTACCCAGCCCAGGCAGACCAGGCCCTGTCTGAAGCCT
GACGTGCAGCAGCAAGAGCAACATGCTACAGACATGTGTCTGTGTGTG
TGTG

Contig 99 (1000 bp)

GGTTCTCAGGCGCACGGGGCAGAGGCTGAGGGTCCGAGGGGCTTTGGGTG
CTGGAAAGCCTGAGTTTGAATCCCAGCTCGGTTTCTTAAAGCTGTGTCTC
CACGGCCAAGGAATGGGGCCTCTCTGGGAAAGGTCTGGGGTGAGGCTGGC
GGGACCTGCCAGCCCCGAGGGCATCTGACCAGACAGCTTCTCAAGCTCA
CAGGGCTTCATGGCAGGATGGGGAAGGCTGTGGTGGGGAGTGGGGAGCAC
TCGACACCCTGTCCAGGCCTCTTGAGTCACGGTGGCCTCTGAAAAGGGGT
TCTCTGTGTCCAATGAGCAAGTCTTTGTCCGGGGCAGGATTACTAAGTCC
AAGGGTGTCTGCCCCCTCCGTGGGGCACAGAGCAGGGGCCCCAGATCACGT
GGCTGTAACCTGCCAGGTTGCAAAGCCTGCCACCATGTCCCCTGGGTCT
CCAGTTACCTTGGGAGGTGCAGGGTGGGGTGATGGGGAACTGAGGCAGA
GAGCTGGCAAAAGAGTGCCGGCAGGGACTGCGGGCGCCAGACCCAGCTAA
CCGACCCTCACACGGAGCTGCTTCTACTTTGCAGCCTGGACGTGGGAAAA
GGTTACCCACAGCAGCGTGTGCAGGCACGCTGGTATGTCTGTGTACTTA
TGCATATGTTCTACGTGCATGCACGTGAGTGTGTGTGTGCATTGTGCCT
GTGTGTGTGTGCATGTGTGTGTGCATCATGTGTCTATACGTGTGTGTAG
TGAATGCTTGTGCATGTGTATTTGCATGTGTATGTTTGTACGTGTGCAGT
GAATGCATGTGTGTGCAGTGGCGGCATGTGCGTGTGTGCGCATGTGTCTG
TTTATACCTGTGTGTAGTGAATGCATGTGCATGTGTGTGTTTACATGTGC
ACGTGAGAATGTGCACTCGTGCATGTTTGCATGTGAGTTTCATGTACACA
TGCTTTTAACGTGTGCACGTGTGCACATGTGTTTCTGTGTCCCTTGACG

Contig 100 (1500 bp)

CGTATAAATATATAAATAAGATAAATAAGATTGATAATATAGATAAAC
TAAACCCATTATCAATACCGGGTGGCCCCAGCAAAGGATACTAGCCAGTT
TATCAAGGTGCTAAGTCAGCACATAGAATGGCCACAAACGAAAACCTGTA
CTGCCTATGTCCACTCTAATGGAGTATGCCACTGACATCAGTGGTAGGTG
AGCTGAGTCCATCTGGGCTCCCAGTTCGGGCCCCGGCTTGTCCCCAACGG
AGGTTCCCTCCAGGGTTCCCCAAACCCAAACGGGCCCCCAGGTCTCCCTG
TCTTGACTCGTTTCTGGAGTCTTCTGGGGCTCTGCAGTCTCCCTTGTG
GGGCTTCTGTCCCCCTGCCCCTGGCCTTGCGGGCTCGGCCCTGCCCTGGG
TCCCCGGCCTGCGGGCTCACCTCCTTCTTTCCCTGGAAGAGAGGGAGCC
AGGCTGGGCCGGGCCAGGAGGGAATGCGCCTGACTCTGCTCCAGATGGAC
AGGTCGGGACATGCAGTGGCCTCGCCTTGGGCTGCTGAGCCAAGAGCAGG
ACGGGTCTTTCTGGAATGTGGGGCCAGCCAGGTTACGCGTGTGGGTGGG
CAGCCGCCAGCATCTGTGAGGGCCGCTGCAGGCGCGGGGAATGACCTCGA
CTTCTGCTTGGCACCCAGCTCTGGAACAGCCCCCTGCGGAGCCTCCGCCC
AGAGCTGGGCCAGAGGGTCCCCTGTGCCGGGGACCCAGCAGGGCCCCCTC
CCTGACTCTCCAACCCACCTGCCTGGGAGGAGTGGCCCCCTGGCCTCCGT
GGATCTCTGGGTGCGGGCTCAGCCGGCTTGACAGCCTGGGAACAGCCAAT
GCACATCCCCAGGCCTGGCCACACCCTTCCACCGGAGCGGGCGGATCTG
CATTTGCGCCAGGCTCTGCGGGCAGCTCTGAGAGCCCCGGGTCTCGGAGCC
CAGCCGTGGCCGTTGTACGCCCTGGGGGCTGTGGACAGCGTGTCTCATTT
GCCCTCCGAGGTCCGGCCCCAGGTCCCCTCCACCTGCTCGCCCAGAGCC
CTCTCCCCACCAACCACTTCCCTGTGTCTTCTGCAAGCGGGACACACT
CCGGTTTCAGGACCTTTGCAGGTGCCGCTTCCCTCTGCAGAGAAATGCCTG
GAGCAGATGTTTGTCCGCACGGCTGCTCCGCGAGGCCTACCGAGAGCCCC
TCACCTAAACCGCCGGGCTCAGCAGCCCGGGGCCCTGTCCCCACCGCCC
AGGTGGTGGGTTCTCCTGTGCCAGTGTGGGCATCTCTGTAAGATACCTGT
TTATCTGCTCATCGTCTGGTCTCCCCAGAAGGTAGAGCAGGGCCCCGGCA
CAGCCGTCTCGGGGTGGCCACTCGCCCTTGGGGCTCAGCCTCCATGCAG
GGAGGGACGCCTGGTGACACGAGAGCCCCGTGTGAGTGTGCCGGGCCGCC
AGCCTGCCTTAGGTACAGCCAAAGCCGGCATTAACCACCAGGCCCTCGA

FIGURE 6, CONTD.

Contig 101 (600 bp)

TCTAGAATACCTGGCCCTCCAGGGACGTGTCCTGTAGCTGCGGCTTTCAG
GGCAAAGTGTAATTAACATCCCCAGGCTTCCCTTCCAGTTGGCACAGGG
CACCCACATGAGGAGCAGCCTCTGGGTGCCAAGGGGCCACTGGTGCCAG
GCGCTGGGCTGAGTGCACCCCGCATGCTTCCCGCCCACTCACCTGCTGG
CCCCACCCCTGACCACAGCACCTGTGGGAACACTAGGCCTGGCAGCCACA
CGCTGCTCTACTGGAGGCCAGTGCCAGGCAGCCTGCTTGGCTACGCTAG
CAGATGCCCCGCTCGCCTCTGCCCCCTGCCCCCTAGCCCATGCAGGAGCCCAG
GGTGGGGCACAGGAAGGACGATTGGGGCCCCAGGTCAGGCACATCCAGGC
CACAGCCGTGGCCACACGAAGGCGGCCCTGAGGGGGCGTTGGGGGGCAGA
CCCTGCCCCCCCCGCTGCCGCCAGCTCCAGGCATTAATTCACAGGGACC
TGTTGCACTGGGTGGCCGCCAGCCTGCCCCCTTGCCCTTCCAAGGCCTCTA
AAATGCCCTCTTTTCGTAAACTAGGACTTACCAAGCTCAGCGAGCCCTC

Contig 102 (1867 bp)

AGTATATCGGGTGAGACTGGGGACCGGTCTGCCGGGAAGCCCCACCATAA
AGGCCACGTTGGGCCACAGTCCGGGCCACGTGAGTGTGGGCGGGTCCGCG
GGTCTGCTCTTGGAACACCAGGATCTCTAAGAGGTACCAGCCGAGGCCAA
GTTACAGTGAGCAAGTGAGCAAATGACTGAATGAGAGCGTGAGCGAATGA
GTGAGGGGTGAGTCCGTCCACCACGCAGCCTAGGCTCAGCCAACCGCTGT
CCCCGCGTCTCCACTGGTGACCAGAACGGAAGAGTGGGGAAAGAGTGGT
TGCTCTCCACAACCCAGTCCCCAACCCCCCTGGACGCCCCACCCCTCCAG
GGGTGCCGGGCGCTGGCCTGTGGGCCCCAGTCTGGAGGCTCTGGCACCTTC
CTCATCCGTTCTCCCAGCACCCAGGTTCTGTGCTGAGCCCTCCTGGCCCA
CAGGCCTCGGGGACAAAGAGGGCCACCTGGAGGCTCAGGGAGCCTCACCT
GCCTCGTGGTCTTGGCGGAGGCGGGTCTGGACATGTGATAGACCGGCCTG
GGCTCAGCAGCTCCTGCTGGAAGATGTCAGGGACAGCCTGGGGCACTCTC
CCACCAGGAGAACTTATTCCTCGGTGGGGTCCCCCGGGGAAGGGATGGG
ATCCCAGCGGGGACCCAGAGCGTCCAGCACACGGACCTGTCCCTCCAGC
CCCTGCCCCACACGGATGCTCACAGCTCAGCCTCGAACACGCACCTGTTG
GACTTTGCCTCCTGAGGCTGTCTTCTCAGCCGACGCGGGCCTCCGCTGCA
TGGTCTGGAAGCCCAGTGGGACTCGGTGGTGACAGGGAACAGGGGCTCTT
GGAGTGGGGTGCCGGGGGAGCCCCGAGGGAGCTGCTTGGGCCTTTGATGG
CTGAGTGGGCTGAAGTCAGGCAGGCTCCCCCAGGGCTCCCTGACCCCCC
CACCTCAAAAAATCCAGAGCATCCTTTGCTTTGGGTCTGGTGAGGCTCTC
TGAGGTGAGACCTGCGTGGCTGGGCCAGTGGGGCTGGAGCAGGAAGAAA
GCAGGACAGCCCCCGCCCCCTGGCCAGACTCCCCAAACCCAGCAGGAGAC
ACCTGAAACGGGATGGAACCATCCTGAAAAGAGCCACCTCCTCCTCTTA
TGCATCAGCTGCCGGGGTCTGGGGGCCCCGCCAGGCCCCAGATGTCCGG
GCTGCTCCCGTCTCACATCCAGGGGTTTCTGGGCCCAGGACTCTGTCCCC
CCAAGCATGCAGAGGGTCCAGGCTGGGGTCTTCATGCCTGCCCGTGTGCA
TGGTGGGGAAAGGAAGGGGACAGTCTGGAGACCCCCCGCCCTCCCCATGCG
TGGCGCCGGGGGACAAAGCCGGCTGGGGTCTCAGGTTTGGGTTTACAGGCA
AACGTTGATCTGACCTGGTTCTGAGATGCTCGGCCCCGATGCTGCGTTGTC
CGCTCGCATTTTCTGTCTTCTCTGGGAGGCGCTGCGTGCGCTCTGGCTT
CCGGCCAGCCCCACGAGGGACGCAGGGTGGCTGGCGGGGTCTGGGGGCC
CCTGCCCCGACCAAGAACGCTTGCGTCAAGTTTTTGTCTCTGAGCCATC
ACTAAGGGGCCACCTCTGACCCGGAGCCCTGTCTCCGAGGTGGGAATTGG
GGGCTGTCCCTGGCGTCATAGGACCTGGTTGGGGGCATCCAGGGCTGTGT
CATGCCCTCCCCAGAAGACTCTGGGGGCTGCGGGAGGGTTTCCCCAGCT
TCGGGCCAGCCTGGGGAGGGCGGAAGGCGCTGGAGGCCTTGCTGTCCCA
GGGAGCATGGCTTCGCTGCAGACTGGGGCCCCGCACACCCAGCCACCCT
GGCCGTCTGGAAGCACT

Contig 103 (650 bp)

GTTGAGGATTCCCTCGGCAATTTCTCGTCACTGGCGCTCCAATCGCCTCG
ATGGGCTTCTCCTCCAGATACAGCTGCAGATCCTGGGCGGGCACACCGTT
GAGCGTCACCTCGTAGTGACAGATTGCACTCGTTGTCAATGGACATCCAGG
CCATGCCGACGGCATGTGGATTCTGTGCATCCGTGTGCTCCTGTGCTTTC
AGCAGAATGGGTTCCGCGGAGTCCCGAGCATCGGGCACTGGACGGGGCAC
TAGGCGGGCCACGGATCAGGCTCGTCTCATGCTCGGTGGCCACATTAACGC
CCAGTTGCCCGGCATACAGCGACTCGAGGACCTTGGGACCCAACTTCTCC
ACACTACCAATGGCCTGGTTGAAGTTGAAGCTCGGCGTCAGATCCTCCAG
CTTGGCCTTCCGCTTGCCCTGCTCCTCAATCAAACCTGATGTTGGGCCTAT
CCCGGGTGTTACGTGCTCCGTTTCGATGTTGTAGGCCAGAGATCCATCG
GTGTTCAAGTAGACCCACGCCAAACCGCTGCTCTTGGTCGAGGATTTCGGC

FIGURE 6, CONTD.

ACTGTGCGGGCGCCAGCAGGGTCTGGAAGATTTTCGCAGCTGGCTCGGGTCA
CGATGTGTCCCTGGATGCGCAGATGTGGGTACTTCTTGACTCCACGGTC
Contig 104 (1630 bp)
GGTGTGTCACTGCTGTGGCTCAGACCCCTGCTGTGGCACAGGGTCCATC
CTTAGCCCAGAACTTGCACATGCCACAGGTGCAGCCAAAAGAAAATTCT
TACTAATAAGTTGTTTCATTTGCCTTTACGTAGAGTGGCATCAAACAGCAA
ATTTAAACACCATCTATCAATACATAGACCGCGGTCAAAGGGAAAGAAC
TTTCTATTTTCAGCACCTTTAACATGGCTTTGCCCCGAATTTGGGACCAGGG
TGCTGTGTTTTTCATCTCTCCCTGCAGGTGGTCCCCAGATGACCAGGCCGG
TCCTGGGCGGGAGGAGCCGGACTGTGGATCCAGTTGCTTCCCAAGACAGG
CTGACAGGAGAGCAGCAAGGGCCACCCCAACCGAAACCAAAGCCAGAAC
GAGCAGAAAAGATGCCGTCTTCCAAGTGGGGGCTGGGAGCTTCTCCCATC
CTCCGGAGCCGTGAGGCTGCCCTGGAGCTGGCAGGAGCCACAGAGGACCC
GGCTTTGACCGCCCCCTCTGGGACCCACAATCAGGACCCCTGACTCAGATGC
TGAGGGGGCTTGACAAACACCCCAAGGACCCCTGCTGCTTCCCCAGAACCGCT
GTGTCCATCAAGGTCCAGATGGCACCCGTGTCCCCACTGGAGCACGCACT
CCGTGGGGCAGGCTTTTCCCTTGGGCACCGATGCACCTTGAGGGCAGAGAC
GGGGCCCAATAAACGTTTCCAACACAGTGGGTGAGGGACCCGACCGGCC
GACACGGCAGCCCGGATGCAGGGACTCCGTGCTTGGCCCAGCCTCCCTTG
GGGTGGTCTGTGTCTCAGGGGTGGATAGGCCATCATGTGGGTGGCCTC
TGGGGACATCCGTTCTCTGATTGGGTGAGTTTCAGCCACAGAGATATTCC
CAGGACTACAAAGCTGGGTCCCTTGGGGCACCTGCTGTCAAAAAAGACA
AGGCCCTGACCCCAAGTAGCCAAGTTCCCCCAGGGGCTCCCCAGGGTCTG
GTATCCAGACTGTGCCAGCCGTGCTGCCCGCCCCAGTCTGCCTGACCC
GAGTCTCTGTAAACATCCCCCGGCCCCACCCAGCTTTACCCCAAGGCCGA
AAGCACCAGCCCCCTGCACCACAGATGAGGCCCCCATGGCTCCCCGACC
TAACCTTCTGTCTGCAGTTGGCTTTTCAGCCTCGGGTGGGGGCAAGGCCTGC
ATCTCAGGCTCCCCGGGAGAAGTTGCTGCCTCCACAGCAGAGCCAGGGGCC
TGCTGACACCTTGGGCCGGGTCCGATCTGGTCTAGAATGCTGCTAAGGTG
TCCTTGACAGGCAGCCCCGGGCGGCCCGCCCTCCAGGAAGGAAGGGGACA
TTGCCAGGACTCAGGAATGAAGCCATCCCAGGTTTTGAATCCCCGGTCCC
ACCACCTTCCACCTCTGACCTCAGGCACCTCGGCTTTTCAGAGCTGCCCTT
TCTGACTCTGGGACACGGGGCTGTGAGGCGCTCTCGGTGTGTGACAGCTG
GGGGGGGGCACTCTCTAACGAGGGTGGGCGTGCCAGGTGACTGACCACA
GCCCTTTCCCTCTCTCAAAAACGCCCGCCCGAGTGACCTCACGGGAGGCAG
GGCCAGGAACCCCAACCAAACCAAGATCA
Contig 105 (1820 bp)
AGTGAGCCCTGCAGGACAGTCTGCTGAGGGGTGTCTGGGCTCCTCAGAGG
CTCATGGCCACGGGCACTGGGAGGATAGCAGGTGGACCCCTGCATCCAGG
TCCCAGGTCCCAGGTCCCAGACCCCGGACAGGCTTTCTATCTGCAGGAG
GGGGGCTCCTGGGGCAGCAGGGATGTGGCTGTGAGGCTCGTCAGTCTCC
CTGTTTCTATCTCTCTGTATCACACACACACACACACACACACACA
CACACACACACGCACGCACGCACACACACAGAGGCGTGACCAGGGCTGCA
GACAGGGCCATGGGAGGACTGCCCCGGCAGTGACCCAGATGGCCACACGG
TGGGGCCCTCGTCCCACTTTTGTGCTGATGCTTCCGCCCAGGCTGCTGG
GAGCAAGCACTAGCTTCCCAGGGCTCTGACCAGAGAGGGATGGGAGGGT
CATGGGTCAACAGGCGCCAGGGAATGGGGAATAGGATCTGAGGGGCGGGG
GCAAGGGGCCCAGGCGAGGCTGCAGTGCCCAGAGCTCCCTGCACCTGCAG
GACCAGCCACAGGCCAACAGCTGCAGGCAGAGCAGGGCTGCTCCTGTCCC
CAGAAGCTGGCACAGCACATGGGGTCTGACAGCCCCACCCGGGCTCCC
ACAGAGGGGCGGGTCCCCCAAACCTCTCCCCCGTCCCACTCACAGCTCA
GCATCTCCACTGCCTGAGGACGAGCCCAACACAGGGCACACACACAT
GCACGCACACACATGAATGCACCTGCAAGCACACACTCACACGTAAGCAG
GTACACACATGCATGCACACAATGAACACACATGCACGCACACACGCATG
CACACACGCACACACACTCAAACACGTACATGCAAGCACATGCTGGTCTT
TTGTCCCCGTGGAGGGGAGGATGGAGGCCAGCCGTGGGGAGGGCATGT
GGAGTGTGGGGGGCTGGCTCCAACGCCCTCGCTCAACAGGCACCAACGC
TGGACTGAGATAAGCCGGGGCGCTGGCTCCCTTGGGGCCGCTCAGCAGGT
TTGACGCCCAACACAGGTGGCACTGCCTCTTTTCAAGACCGATGTGGCC
ATGCCACCCTCACAGCCTCACCAGTCCCCCTCAGCTTTAGTGGTGTCCC
TGTCATGTACCCGGGGCTTCTTCTTCCAGGGCCAAAAGCGAGTTCAG
GGGACAGTGGCGCCCCATAATTACTCACCCAGGGTGTGTCTCTGTGG
TGGCCTTGAGGCCAAGGTGCTCCCATGGGGGCCACAGGGCTGGCAGGGT
CACTTCTTGAGAGCACCCAGGGCCAGGGGGTGGCCAGGCCTGGCCGGT

FIGURE 6, CONTD.

CCCCATCTGGAATGAGGGCCTTGCGCAGAGGCGGTGCACCCCTCTTTACA
GCAGCCCCGGGGGAGAGTGACTCCTGCGTCATGGACCTGGGGGCTGACCT
GTCACGTGTCTCGCCAGTTGCACCCCATCCATTTCCGGGTGGAAGGGAC
AAAGCCATCCTGGTCTGCTCAGAGGACCTCTGGAGCCTCTTGGCCCCAGC
AGCCCCAGCCCCCTCCCGGGCCCCGCATCCTCTGCCCACCCAAAATCACCTGT
GCCCCAGAGGTCCCTTCTGGGTGTCCAGGGCGACCCAGAAGTGGCCCTG
CAGACACACCCAGCCCAGGACATGGCCGCTTGGCCGGCCTGTCTGCCTG
GGGCAGCCTGACTGCCACAGACAGGCCGCTTGGAGGACCATCTGCCTGAG
CCCCCAAGGCACATCCCACGGGGCCACACAGCCAGCGCCTGTAGACGAT
GCCACTTGGGGTGGGGGGAG

Contig 106 (1500 bp)

TGCCGAATAGAGGTGGAACCAAGACCCGAAAAAATGTCCACATTTTTCA
ATTATTAGAAAATTTAGAAAAATATTTTACAGGAGTTAAAAGGTATTCCAT
TCTGGGGGCGGGTGGGCATGCCCACGGCATGCAGGCATTCCCCGACCAGC
GACTGAACTCGAGCCACGGCAGTCACCATGCTGGATCCTTAACCTGCTGA
GCCCCGTTGGGCAACTCCAGACACTCCATATTTCATGTAACTATTTTTTAAC
CAAAAAAATGACAAAGCTTTTCAAAACAAAACACATTTTCATGGGAAGAGT
GGCATTGCTTCACGCCTGGATGGTCTGCTGCGGCTTGCGGGACGACGAGGG
CCCCCGCGGGAGCGCCTCCGCACGGCGCATCAGGACGTGGTGTCCAGGGA
AGCGGGGTCACTTCACGGCCTCTCGGGTGCCTGCTGGGTTTCCTTTTCGGC
ACCACACCCGACTCAGCACTTGGGGGTTCCTTAAACGTGAGAGGCACTGC
GGGGCTCGAAGCCACATCACTGACCTCCTCAGACTCTGTTATGTGAAAAC
CCATCCGTCCACGAGACCAAGAGACAGACGAACAAACGCAAGGTGGCGC
CTAGGTTGGGACACAGCATGAGGGCAGAGCGGAAACCTTGGCGAAATCCCG
GCGAAGCCTGGACGTGCGCCAGCTCTTACTTGACGCAAAACATAGGGGGATT
CAGGAACTCTCTTTACCGCATTTGCAATTAATTTGCTGCAAATCTAAAAT
CGTTCCAAGCACAATGCTCACTGCATGGAAAAACCCAGGGGTAGGTCTCG
CCCGATCAGGATGTTTTCCCGTGCCCTCTGTGCGGGTGTGCCCCCTGCG
CTGGTCACTGAGAAGTGTCCCTCCACCGACGACATGAAACTTCCAGGTC
CACGCTCTCTGCTGTCTGGACGAAAACCTCATCTCTGTGAATCTCCCGCC
AGCTCCGCGGGAGCCTTCCAGGGCTGGAAGGACGGCCGTCCCGTTCAGG
GGGCAGGTGCACGCTTCCCAAAGCTCCGCGTCTGCTAGGACGCTCAGAC
GGCATCACCCACAAACCCACGAAGTGTTCCTCGAGGCGACAGGCTCG
CCCTTCTCCGAGAAAGCAGCCCGCACACGTACGCAAGGGGCCAGCTGCGT
TTGTAACCTCAAATGGCCACATAGAGTTTGTCTGGAGGCACGGGGTCTGT
CTGGGCGCGACCACTGCACACGCAAGATATGCTGGGACACGCTCCGGGGT
CCAGCTTCATGGAATTAATAAAGTTTACTGCTTCACCAAGTACATTCTTA
AGTGTAGCTGGCCGCCAGCCTGGGCGTCCGCTCCGAGGCTGCCTCTCTGC
CTGGAACCCCTGTGCTGGGGGACCTCTCTCCAGCCCCACCCAGCCCCG
AGCCCAGGCAACATCCTTCTTGTAAAGACACCCGCTACCCTGCCCTCCCG
TTCTCCTTCTCTGGATCCAATCTCCTCCGCTTCTAAGCTCTCTTGAGGCT

Contig 107 (550 bp)

ATGGCACTCGCGTTGTGACTGAGCTACCGGACGGCGCGAGCAGGGCCAC
GAGGGCGACAAGCGCGGGGCTGAGAACCTGTGCGAGGGCAGGTCCCTGCG
GCTGCAGACAAGCCTCTATCGCAGGCCCACAGACAGGAGCCCCCGTGTGA
CCCTCAGGCTGCGAGACCAAGTCACGGCTCTGCTGGGAAAACCTCGAAC
CTGATGACTGGGTGGGTGACCCAGGACCTTGAATTCCGGCCTCTGCAGA
ACGCTCTGAGCCTACGGGAGTGGCCACCCTCTCGGTTAGGGCCTGTGTCC
TTCCCTGGCTTCCAGCCTAGAGCAAAAGCATTAAATCACAGTGTGGCCCA
GCCCCGACCGTGCAGGACCTTAGACAAAAGAGGAGGGAGAGAGATGAG
GCAGAGAGGCGAGAGACAGAGGTGGAGAGACAGATAGACAGAGACAGAG
GCAGAGAGAGACAGACAGACAGAGACAGAGGCGGAGAGACAGACAGAG
ACAGAGGTGGAGAGACAGGCAGACAGAGACAGAGGCCGAGAGAGACAG

Contig 108 (900 bp)

TTTCTAAACTCTCTTACTAGTTCTAGTTTTCTATTGTTTTCTGGGGGGGT
TCTATATAAACATTTCGTGTCGTGATTGGAGATGGTTTTGTTTTTCTCT
CCAAACTGTATGCCATGTGTTTCTTTTTCTTGTCTTATCACACTGGCTAG
GACTTCCAGTAAACACTAGATATGAACAATGAGAGGAGAGCCAGGCCCT
CTTCTCAGTCTTGGAGGAAACAGTCAGTCTTTCTCTATTTAGAATGAGAG
CTTTTCTTTTCTTTCTTTCTTTCTTTTCTTTTCTTTTCTTTTCTTTTCT
AAGGAACCTTCTCTGTATTCTTATTTTTTTTAGAGTTGTTATTTTTTTTT
CTCTCTTTTTAGGGCTGCACCCGAGGCATATGGAGGTTCTAAGGCTGGGG
TCGAATTGGAGCTACAGTCGATGGCCTACGCCACAGCAATGTGAGATCTG
AGCCACATCTGCGACCTATACCACAGCTCACAGCAATGTGAGATGGTTAA

FIGURE 6, CONTD.

CCCCTGAACAAGGCCAGGGATTGAGCCCGCATCCTCATGGATGCCAGTC
AGTTTCGTGACCGCTGAGCCATGAAGGGAACCTCCAATAATGCACCAATT
TTAAATGAAAAAGACAAAGCATCCAGCCACAGCCTGAGTAAGGAGTTTG
GAGGCCTGACCCCTGCGTGGTCCTGGGCCTGGGCCTGGGCTGGTCGGGGT
GGGGGGGGGTGGGGGGGACCCTGTGGACCTCCCTCCTCAGCCAGGCCTG
CCCCCTCCATCCCTAGCTGTGCGGGGCTCGGAGGAAGGCGGGTGGATGACG
GTCCCTGGGACCCCTCCTCATATGTATCTGGGTCCCTGGTCCCTCTGAGG
CCAGGTCAGGTCATGGGAGTCAAAGGTCAGCCAAGGGGGTAGCCAGAG
Contig 109 (950 bp)

TAACCCACTGACCGAGGCCAGGGATCAAACCTGCAACCTCATGCTTCCTA
GTCGGTTCCGGTAACCACTGCGCCACAACGGGAACCTCCTTGTCTTTGTTT
TTAGGATTTACATACACGTGATAACGTGCCGTATTTATCTTTCTCATCT
GAATTATTTCACTTAGCCTAAGCCCTCAGGGTCCATCCATGGTGTGGG
AGTGGCAGGATTTGCTTCTTTTCTTTTCTTTTGTGGCTGAAAATCAG
TCCAGGATTATCTTCTTTTCTGTTCATCTGTGGAGGACACAGGCTGCGT
CCGTGTGACGCTCTGCCGGGAATACGGGGGCCGATCGCTTCTGAGCCAG
TGTTCTCATTTTCTTGGGAGAAGTACCCGAGTGGAACGGCTGGGTGCTC
CTGCAGTTCTGTGCTGCATTTTGAAGACGCTCGGAGCGCTTCCACAG
TGGCTGCACCGACTGACATTTCCACCGAAGTGCACGGATTCCCCATCCT
TTTTCCACGTTTTCCCCGCACTTGCTATTTTGGCCTGTGGATGTGCGCC
TCTCCGTGAGGTGTGAGGGGAGTCTCCGTGCGGGCCAGGCGAGGAGCGAC
CGTGAGCGTCTTTACGTTCCCTGTTGGGCCACCTGCGTGGCTTCTCCGG
AAAAAGGGCTGTTTACGGCTTCTTGGCCATTTCTCAGTCTGATTGTTTGGG
GGGTTTGTCTGTGAGTTGTGTGAGTTCCGCACGTATGGGGGGCATCAACC
CTTTATCAGCTATGCGATTGGCAAGTCCGTTCTCCCATGTTCCGCCGGCC
GCCTTGGCAGGTGTGGGCGGTCTCCTTGGCTCTTCCCTGGTGCAGAAGGC
TTCGGTCTGATGTGGGCCCATTTGTTTATCTTCTTTCTTCTCACCCT
TGTTTTGATGTCAGATGCAAAAATCCATTGCCAGGGTCTGTGCCGAGAAC
Contig 110 (306 bp)

CGCCACCTCAATCGCCGTTTGTCTGCAACACGGTCCAGATAACCAGCG
CACCTAACAGGTCGAACACTGCCAGAACTGCCAACAGCGGGCTGAAGCCG
ATGGTGTGAGCCAGTGCACCGACAACCAGCGCAACAGCGTACTTGCCAG
CCATGCGGACATCCCGGTTAAACCGTTTGGCGTTGCCACTTCGTTACGAC
CAAAACATCGGAAGAGAGCGTAATCAGCGCGCCAGACAGTGCCTGGTGG
GCAAAACCACCGATACACAGCAGCATAATTGCGACATACGGGTGGTGAA
CAGGCC

Contig 111 (800 bp)

GTTTTCCATGATGCACCAGGGGGCCGGGACCGCAGCAGGGAAGGCTCCA
TCCTGGCTGTGAAGACCTTGAAAACACCTCATTCTCTGGTCTTGGCCT
GCTCTTCGGTACGCCAAGTTGCTGAGACTGATGTGGGGATCAGTGGGGAG
CAGGAATCTTTCTGATTCAGCCGTTTCAAAGTGTCCCAAGCAGAAGCTGT
GATGGCAATGCCAAGGCTATCCATGGAGGTGGCTGTGCCAGGGGCCCAT
TTCTGGGAGCCCATTCAGGAAAGGAATCTTGTAGCCCCAGGCTCCAGC
AGCCAGTGCACGGCCCCCTGGGACTATCCGGGTAGATCAGAGGGAGGAACA
GAGCTGTGGATGGTAAGCAGGTGGCCCAAGTCCAATTTATGTCTGTGGTC
CCAGCAGGGTGCCAGGAGGGCCCCCTCGTAACCTCTTAAGAATCTTGGTCTG
GTCAGCTAAATTGTATGACCATTGTACTGAGCACACATCCCGTTTAAGTA
GAATTTTCAAGGATGACTAGGAGTTTGCCACCTGAAGGCAGGAAGGGCAT
TCCAGGCAGAGGGTACAGAGGTGAGAGGGAGGCTCTGACACTTTGGGCGT
GCAGGGGGTTTGATGTGACTGCAGCTGGCACACAGTGTATGCCAGGCCT
GGCAGGGCTGTGTTGGTGTGTTGGAGAGGAAGGGAGAGGTGAGTTGAGCCC
AAGGTCTTCCAGGCCAAAAGACTGAAGGTGACCGCGGCTGTCCGGGGCTG
GCCCCGAGACCAGGAGGGAGCAGGTGGGAGCTGGCTCTTGTTCGGGGAC
Contig 112 (3062 bp)

CACACCCAGGAGAGGAAAGACCCACACAGTCCTGATGACAGCTTGGCTC
GGGGCTGGAGCCCCGAGTTATAAATGTCCATCACGAGCTGTGTTCTGTCA
GAGCCATCAGTGGGAAGGCCAGGCCAGCTCAGCAGCCAAAAATGAAGAG
CTAGGTCTGGGATTGGGCCCAAGCAGAGGGCACAGGAAAGCCACATAAAC
AAGGCACCCAACCCCCCTGTCATCCACCAATGTACATTAGGTACACCC
CCTGGTCTTCGGGGGAGGTCCCTAAGATCCGGTGGCAGGGGGAGGAAAA
GTCTGACTGGATTCTTTGACAGGTGTATCAGCGGAAGGCCAGGAGGAGTG
CTCGGGGACTGCCACCTCCCAGGGGCATGATGGTCATGGACCAGATGGCA
GTTATGGGAGGAACCTCCCCCGTGGTCAGAGCTCTGGGTGCTGTACCTGG
TCATGCATTTTCAGTGGAAGGAAAAGAAAACATACAACTCCACCCCCAGC

FIGURE 6, CONTD.

AGCTTTAGGCTGTTGGTCTAAAGGTCTGCCTCCTGGAAGAGACACGCCT
CTGTCTAGCGGACACTGCTAAACCTAAAGGAAGAAGTGCACCTGGTCACG
GGACTTCCTAGGCCAACCAACCTACAGGTGACGGCCCGGAGCATCACGAG
GAGGTAGGGGACGGGAAGGGATGCATTTGCTGCTCAGCGGATCCACTGGG
GCGTTTCTGGAGCCCCACGCCACACTTTACTGCAAATGCACAAGCCCC
AGGCAGCAGGACAAGTCACAGTAGCTCTGGGTATCCAAGGAGTCAGGGA
CCTACCTGGAAGAGTCTAGAACAGGTGACAGAGGAGGGAGAGGATGGTAC
CAGCAGTATAGGGAGAATCAGAAATCTGACCCACCTGGGGGCTGACTG
ACTCCCAGACCAAATGCCACACTCAGGTTCCCCGTCTGCCTGCACTTCCA
GGGCTGGGGCCACGGGAGTTATGGGCCCCAGGTAGCATCAGAGGCTCCCAG
GTACAGGCACAAGCAGCAACCACAGGAGGGATCCAGGCCAGGGAGCATCC
AAGAAGCAGCAGAAGCTCCACCTTAGGTACAGTTCTGGCACCTCCAAGTT
GAGAACATGTCTTAGACAGTGCCTGACCCCAACCAATGGAGTGTCTGGG
ACTAGACTAGGCACGCCATTTTGGTCCCAGGTTGCCCCATCTGTACAAAG
GGTGTGCGGCCCCCAGGGGGACACAATGAGCTCCCATGGGAAGGGTCTTG
CGAATCTCCTTAGAAGCAGATGTAAGAGGTGACGTCCAGCTTGTGCCTGG
GATGTAGAAGTGGAAAAAGCACCCCTCCCCCGACAAGGATGAAAGCAAGA
GGCACAACCAACCTGAAATTCCTAACGCCCCCTGGAGATCCTTGGAGAAC
TGGGATTCTCCACCTGTAGGGGCACCTGTGAGGAGAGGCTGTGTGAGCAC
CTGCTGACCTGGGCACAGAGGATGCCCAATACTAAGAAGCATCAGCTAAAA
GTCTCCAGGAATTCCTGGAAGCTGAGGAAGGGCTCAGGAGAGGGTACAGA
AGCCCTGGGGCTATAGATATAAGGGACGTGCACACCCACTTGCAGGTCCC
CATGGACCCCAGGGACATTCACAGTGATGGGCAAGATTCCCAAAATGCAC
CCCTTGTGTGTGGGCCTGGTTCGGTGGGTGACGAGACACACACCAAGG
CACAAAGCACACACCTCAGGCTACTCTCCTCCCTCTCCCTTGTGGAACA
TGAGCCTTGAGATGCTGGGGCACGTGAAAAACACTGTACACTTAGGTCC
TGGTGAAAACCTGACTGCGGCCAGCGGAAGAATCATAAAGACCCTACACC
CACACACAGCCTTAATTACAGCTGTGAGTGGGGCTGGAGCCCCAAGAATG
TCTACACCCATAAGACATAGCGTTAATCAGAAAAACAAGAACAGCCCCAA
CCCCACCACAGGCTGACAACTAACAGGTCATGTTGGAATATCACTGGGA
ATGTTCTAGGAGTGTAGAAAGACACACCAACTAGGGCATGATGCAAAGAT
AATACTTCAGCCTGGGAGTGGATGTGACACAGGGAAAAGCATAAAGTGAT
GGCAGAGGACTTTGATGTGATGATGGAAGCCACAAAAACTTCTAGCTTA
GCTCCATTCCTCAACAAGATTGACTGCAACCCCATGCTAAAACAACAGCA
AAAAGAAAAGATCCTCATTTCCAGGCATAAAATTTTCCCCCAGTCTCTG
CTGCTCCTCCATAAGATGTCTGATTTCAACAGGAATTACGAGGCTATAAGA
AAGGCAAGAAAAAACTACACACTGTCAAGAGAAAGCCATCAGAATAACCA
GACTCGTAGCACAGACACTGGAATTGTGAGGATATTTTAAATAACCGTGA
CAAAATACATTAAAGATTCTAATGAGAAGGGGGTAGACATGTAAGATCACA
TAGATTTTACGCAAAGAGATGAAACTCGAAGGAAAATTAATGGGAGCCCT
AGAGTGAAAAACACTGTAGCAGAGAAGATGGGTTTACCGTAAACATGAC
ACAGCTTAGGAAAGAAATCAGTGAACCTGAAGACAGGGCCACAGAAAATAT
CCAAACTGAAATGCAAGGAGGAAAAATAATGAAAGGGGGAGAGAGAAAAA
ATAAAAGAACAAAGCATCCAAGAGCTGGAGGGTGACACTGAAGAAGAGAG
CATAGGCATAGCTGGAATCTCAGAAAGAGAGAAAGAAATAACCCAAGATG
TAATGGATGAGAAATTCACAGAAGCGTTGTCAAGCAACAAACCATAACATC
CAAGAAGCTCAGAGAACACCAAGCAAGGTAAGTACTGTAAAAAAATAGCC
CGAGGTATACCTCATTCAGGCTGCTGAAAAATCCATGACAAAAGAAGTCTT
GAAAGTAGCCAGAAACAGAAGGCGTGTTCATTTCAGAGGGAAAAGACACC
ATTGTTGCCAGAAACCAATAAACCAGGGCTGAAAGGGTAAACCTTTTTT
TTTTTTTTTTTTTTTTTTTGGCCATGCCTGTGGCATGTGGAGGTTTCCCGA
TCAGGGATCAAC

Contig 113 (1300 bp)

AAACGGATAAATACAGGTGACCCACAGGCAGAAGCTGAAGTACAAACAGT
TCACAACGGCACCCAAAAAATACCGAAGGCTCAAGGGTAAATCTGACCCC
AGATGAAAGGCCCTTCTACGGAAAAATGGCAAAGTGGCGCTGAGAGGCATG
AGAGGTTGCAATAGATGGAGGGCTCCGCCGTTTTCCCGGGTCCGAGGATT
CAGTGACGTCACGACGCCAATTCTCTGAAACGCCTCTCTAGGTTTCAAGT
CAGCCCAGACCCACTGGCAGCCGCCCTCGCTGCAGAGACAGCCAGCTGG
GTCTTGAGGTTCTTACAGCGAAGCAAAGGGTCTAGAAAAAGCAGACGTCT
CTGGAAGGGGAGAAAGCAGCCGATGGATTGGCATACGGCGACAGGAGATT
CTCGGACAGTGGCACCAGGAGAGGGGTGGACAGAGACTGGTGCAACCGAG
CGGGCCCAGGAATAAGTCCACACCCACACGTACCATCTCGTTGTTTATTT
ATTTTTTCTTTTTCAGGGCCACTCCTGGGGCATGTGGAGGCTCCCCAGCC

FIGURE 6, CONTD.

AGGAGTCGAATCGGAGCTGCAGCTACAAGCCTACCCACAGCCACAGCGA
CACAGGATCTGAGCCATGTCTGCAGCCTACACCACAGCTCCCGGCAATAT
TGGATCCTTAACCCACTGAGCAAGGCCAGGGACTGAACCCACGTGCTCAT
GGATACTAGTTGGGTTTGTACCCTGAGTCACAGTGGGAACTCCTTTAA
TTTTAATTTTTGAAGGTTCAAGACTCTTTAATTTTTTAGTGAGGTATAGA
TTATATTACGCACCATTTCTTTCTGACTTCGGTGCACGGCTTTTCAACAA
ATGGGTCTGGACCTGCTGGGTGCCTTCTTCAAATGAACCACAAGCCCTC
CCTCGCGCTGATGCAAAATTTAACTCGAGGGGCTCATAGACATAAACGT
AAACTCTAAAGCTATAAAATTTCCAGAAGAAAACGTAAGGAAAACCTTTG
GGGTCTTGGGCAAAGATTTCTTACCCATGACAGCAAAATTACAATCTACA
GAAGAAGTGGTGGCCTTTATCGGCATTTAAACACCTGCCCTTTGAATGA
TGCTGTGCGAAAACCGAACATGCAGCAAAACGGATGCAACTAGCAGGTCT
CACACTAGTGACCCACGTGAGAAAGGGAAAGACACGCCACGTGACATCC
CTTAGATGCAGAATGTAAACACGGCCCCCGTGAACCGACCTCAAGAGAG
AGACAGACCTACAGACGCAGCAATTTGGGGTTGCCGAGGGGGATGCCGG
Contig 114 (3000 bp)
TGTGAGACCCCTTGGCGGGCCAGGACCCCCAAGGTGACCGAAGGCCTCA
GCGCCCCCAGCGGCCCATCCCCCTCTTTCCCGACACAGGATTTTTTCC
CACCAAGCTCTGTTCCCTTGGTCACGCTCTCACTTGAGCAGCCTCAGGGT
CTCCCGGTGCCTGTATCCACGACAGCGTGACCTTCTTGGTGTGTCAACCC
AGGACCCACGCTGGCCAGCCACGCCTTCCCAGAGCACCCCGCCCATCC
TCAGAGTCCAGAGGAAAGGCCCCCATTGACCCAGAAACCAAAACGCAGA
GACTCTGGGACGCCAGCAAGAACGTACACTGACTCCACCTGCTTCAGGC
ACGGAGGCAGGGGTGGGTTATGAGCGACCCCGTGAAGGGCCTTCTTGTC
CATCGAGGGGCTTCCAGGGGCTCCTAGACGGGGATGAGTGTGGCAACATG
TCGCCGATTACAAAAGACCCTGCAGTGCTGCTGGGATGGGTCCCCCGGC
TAGAAAAGCAAAGGATTCCAGCCCAGTCGAGTAGGAGGCGGCTCGGAGG
CTGCAGAGGCGCGGGGGGCGCTGACCACCACTCGGCAAGCCCCGTGTTGG
AGGGGACGCCCCGGCCGGCTGCAGCCGGTGCCTCCGGATAAGCTCCTA
AGAGCCCGCTGCCCCATGCACGCGCGTGCACACACTCGCTGCCCGAGGG
TCCTTCAGCACAGACCTTGTGGGGACGGAGGACCTGGCAGGGGTGTGGC'I
CTGGGGAAGGGGTCTGTCCCAGGAACCTGTCTGGATTTGGGGGTGGGC
GTGGATATCCCGTCCCAACCTACAGAAGGGAGGGGCTTAAAAAGAGCCCC
TTTGGTGTGAGGGGCCAGCAATCCTTTGGCTTTTCTTGGCCCACTTGGA
GCTTGACGTCTGGTCACTGACTGGGAGCCAGGGCCAGAGGGGGCAGCCG
GGCTGAGGCAGGTTTCAAGGCCAACCATCTCTCGGCCACACTCCCGAGGTCTG
GGCAGCTACGGGGCCCCCAGAGACACAAGCCCCAGGGGTCTTCCCCCCC
GCCCCCTGCCCCAGATCACCAGGAGACCCAAGCAGCTCTGCCTCCCCGTG
CCTGAGAAATGCCCCATCTGGGTACCCAAATCACCTCCAGAAAGGTAGA
CTGGGGGGCCAGGACAGGGGGACCCAGTTACAGAGCCCCAGGCAGGCT
TCCCAAGGGCGAGGGGACTCCGTTTGGGGCACAGACGGAGGCAGAGCGGG
CTGATGGATTCTCCCCCGGTTTCAAGGATGCTGGCTGCCTGGCCTCCAGGA
GCCGGCGGTGCCATCTGATCTGATTAAAGGCTGCAGTCCCAGCTGGGCGG
GCACAGCCTGGGGGCTCGGCGGGCAGGGAAGAAGGCGCTGTGCCCCAGC
CGGTCAAGCTCGCTTTCTCTTCAATTCCTCTCCATTAAAGTGTCAGAAC
CATTTATTGATTTTTTAAATCAGGACGTGCTGTCCGTGACACAGCAAAGT
GAACAAAATCAGAGCAAAGAGAGAGGCCAGGGCTGAAGCCCCAGAGGGCGGC
GCCTCCAATCCGGGTTGTGCCCCGGGGCTCCAAGCCCCCTCTTCTCTGG
GGTCTGGGCGTAGTGGCCAGGGCAGAATGCACCTGCCGTATCCTGGGA
GGCTTGGCCATCGCTGGCTTCTGTCTCATGACGCACCGTCGTTCCATATC
TACGGAAACAGCTTCGCATTAACAGGCAGGGGAGGCGGTTGTTCTCCTT
TATCTGCCCAACCATCGGCGCTGGGGCCACGTGGAGCCAGCCGGCTGACT
TCCCGCTCTCTGCTGCTGCTGAAAGTTCCACCAGACGCGTGTATACCCTG
GGAGTCAGGAGGATGGGGGATAGTTGGGGCTTGACGTCTGTTTCTGAAAA
AACACCGTTTTTCCCTGAAATATATATGTATTAATTTTTTCGTCAAGATAAA
ACTGTGTATAGTTTTTTCGTGATGAGAAAACGCATCCATCTCCTTAGAAA
GCCTGAAGAGGTACAGGAGCCTATAAAGGACAAGATGACAGATGCCCTCTA
ACGCACACCAAATGTGCGGTGGCCCCCAGGGGACCGCATAGACGGGGCGG
CTCCAGATGGCCACCGTGTGCGAGGGACACGGTTTCAAGGTGGCAGAGTAT

FIGURE 6, CONTD.

TCCTGGGGGGGGGGGCTCAGCGGTTCCCATTTCCCCCTCCCTTCCTTCC
TTCATTTCTTTCTTCTTTCTTTCTTTTGTGGTTTTAGGGCCGCACCCG
CGGCGTGTGGAGGTTCCACGCCTAGGGGTCTAATCAGAGCTACAGCTGCC
GGCCTCCACCACAGCTCACGGCAACGCCGGATCCTTAACCCACGGAGCGA
GACCAGGGATGGAACCTGGGACCTCATGGATCTTAGTTGGGTTTGTTCCT
GCTGAGCCACAACGGGAACCTCCAGCCATTCCCATTTCTTGCTCCAGTTCC
AAGAAATCCAATTCTTATTCCTGTTCTTTAAGGCCAGAGGCGACAGCCAC
GCCGAGTCCCAGAAGCAGGGGCTCAAGGATGCTGCTGTTGACTGTGTCCGT
GGGCGGGGGGAGTTGATAAGAACCCCAACACAGGGTGGTGGCCAGCAAC
GGGGGAGGGAGGAGGGGGGCTGGTGGGGAAAAGTCCCCTGAACCCCATGG
GCTGCCCCCTCCAGGCTGGGGCACGACCCCGAGCCCCATGGCCCCGAGGAG
AAACGGTCCCAGCCCCAGGCTGGGCTCCCGCACCCCTGCCCTGACCCCGC
Contig 115 (1895 bp)
TCATGGAAGCCCTTATCACAACCTCGGATCCAAAACCCACTGCGCGAGTC
CAGGGATAGAACTCGCATCCCCACAGACCCTATGTTGGGGTCTTAACCAG
CTGAGCCACATGGAAACTGGGTAATCTATTTTTAGATGTTCTAGGGTTT
TTGGCCTTGCTGTACGTGGGGACGCTGCTGGGCCAGGGATCAAACCCGC
GCCACAGCTGTGACCCAAGCAGAGCAGTGACAGCACCGGATCCTTAAGCA
CGAGGCCAGCAGGGAGCCCCCTGTGTTTAGATTTTGGTGAGGATACTGCGT
GGGATTACAGGATATCACTTTGGGGCTGTTGGAATTGCCCGTCGCTGTTT
AAGCAAAGAGAAAATCCCTTCACTCTGTGTAACTGTGGGGAATCCTTTAG
TCTCTTGAACCATTGCGTGTGTTAAGAGTGGAACCTCTGCCACCATAA
ATGCCAGACCAGCGCTTCCTGAGATCCGCTTTTGTGCAAATATCTGG
TTTGAATGCTTTGATCGCCCGACCCAGACAGGGTGGGCGGACGCCGCCG
GGGACCCGACGTGACCATCGTGCTTCTGTATCCGCCCTTTCTCCGGCACG
CGCCCCCTGGTTGCTTCTGGCTGCTTTTAGTGAGGAACTGAAGCCTCGC
CACCCAGACCCCGAGACCGCAGGACCCACAATGCTTCAAACACCTGCCCT
CTGACTTTTACAGGTCAAGTTCGCCAACGCCGAATTTGCACCGATTGGCT
ACAGAGAGCACGTTGGCGCCAAGCCTCCACTTGGAGTTTATAAGGTCTC
CTTCCAGCTCGCAATGAAAATGAGCTGTGATAAGGCAAAGACAAAATTAG
TATGAAATCCAGATGCTTCACTACAATAACAATGACCGCGGGATTGGGT
CTGAGCGACTGAAATCAAGGTGGGCTTCCGGAGGGAGGCTGTTAGAGGAA
AGGCATTCACGGAGGCTCAGGTCCGAGAGGCTTCCACACCCCTAAGAGGG
CTGAGACGGCAAGTAGGGACCAAGCCCCGAGTCGGGAGAGCTGGGCAGG
AAGGAAGTCTGAGGTACCCCCACCTGGGGAGGAACTGCCTAGAGAAGCG
GGGGCGGGAAGCAGGGGATGCCAGTCCCAAGACAGGGACAGGGCGGAAA
GGGCTCTCTGCAGGCCCTCAATGCTGCCACAGTGCTCTCGTAAGAGGGAG
GCAGAGAGAATTGACACCGGGGAGACCACGGGACCACGGAGGTGGAGACC
GGGCTGCCCGCGCGTGCCAGTTGCTCCCGAAGCCGGCCCCCTCCCCAGAG
CCTTTGGGAAGAGGCGCCAACCTGCAGTTCTGCTACTCGGGGACAGGGAC
AGGGACAGCCCCCTGGAGCCGCTCTTAGGGGCAGCATCCCCAGAACCT
TCCTTAACAGACCATCTGGAGAGAGATGGGTCTGGGCTGCAGCTCCTGGA
ACTGTTTTTGCCACCCCGCGAGCACCAGTGGGTGCCAGCCTGGGCTGCCC
AGCCTCAGGGCCGGGGAGGGCTGAGGGCACTGGGGCCCGGCTCTGGGACT
CCCCTGCTCCTGCCCCGTGCAGGACAGCCACCTCCCAGCATCTGCTTCCT
GCCACCCACATCCCCAGGACCGTCAGCCCAGGCATGCCCTGGCGTCGGC
CACTCACACCACAGGCCAGGAACCAAGGGGGCAACACAGAAGGGCAGTT
GCCATCTGCAGATGGAATGGACAACTGGGGTCCGTGATGATGGCAGGCT
CTGGGCGCCCGGGCTGGCAGGGGAGCCAGGACTGTGCGGCCATCACAGGA
AGGGCATGACGGGGTGAAAGCAAGAGTGGAAACCTCTGCCACCCGCCTGG
GCGCACATACCGGCCACCCTGCAGCCCCACCCCATTTGTTTGCT

FIGURE 7

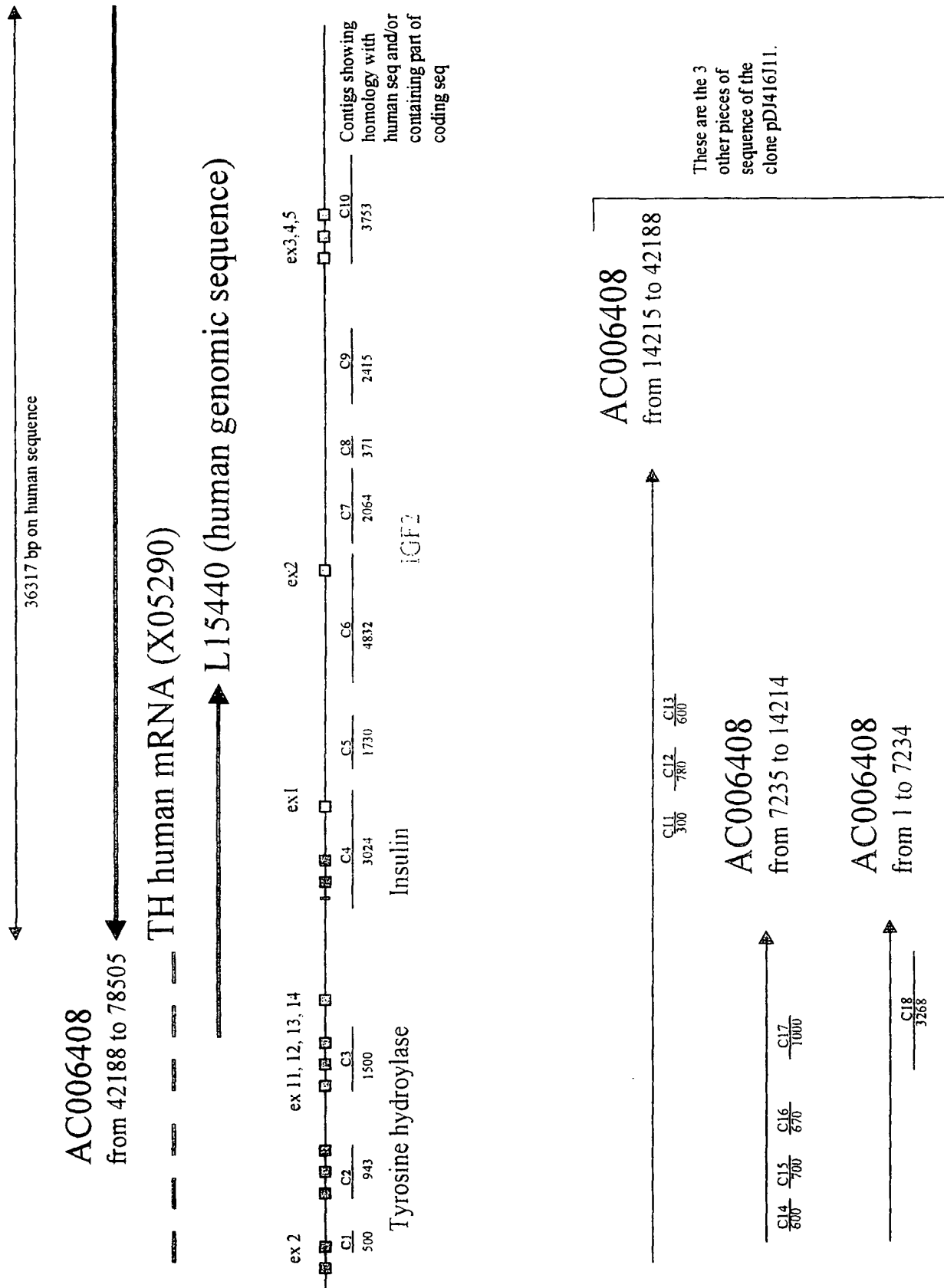


FIGURE 8

Contig 1 (1040 bp)

GCGCGCCGGATCCTTAATTAAGTCTGAGAGATCTGCGGCCGCGGCCAGGGTCTGCTTCTG
GCCAAGTGTGGGGCTCTGCTCCATCCTGGCTCGGAGGTCCACCCATGGCAAAGCCTGGGG
TCCTCCCCTGAATATTTGGGGGTCCACTCGTGCCAAAGGCTGGGTGTCCAGTGTGCCAA
CGGTACATGGAAGCAATGTCTTCCCAAGGACCGTCCAAGGTGTGGTCAGGCCTGGACAGC
TGTGAGTCCCTTCGGGACTAGACTTGGTGGCCGAACCTAGGGACCGTGCCCGAGGGCCC
CCACGAGGCCAGGTGTTTGGCCCCAGGGACAGAACGGCCAAGGGTGGCCGAGGGTCTTTT
TGTTTGTTTTTTCTTCTTTCTTTTTCTTTGGCCGAGGGTCTTAAAGCGCTCTCTCTG
CTCTTTGTCCCCTGATCCTGAGCGGGCAGTGTCTTGGTGGTGGGGTGTGGGCAGCCGAG
CAGGGCTGAGAGAGCCCCGCTTGTCTACTAGGGCGCGCCGGTGAGCCCAGCGGGCATGCCG
TGTCAGACGTTGGATGGGGCAGCGAGGGGACTGGGGTGGCCCCAGCCCCGTGGGAAGCC
CGCCCTGTGGAAGCCGCTGTGCTCGCCACAACAAGCACCGTCTGACTAGCTGGTGAATCAG
CGCCCGTCTGCCCCGCTAATCCCAGGCGCTTCTGCCCCAAGCTGAGCCCTGACCCACACC
CCTTGCGACCGCTCCGTGGACCTGGGGCGATGAGGTGAACCGTGGGCTTGGCCATCGTG
GTGGCAGACGGTGGCACACCCGTGCGCCTGTGCGCCCCCTCCATCCAGGAGCAGAGTGC
GCACCCAGTGGGGGCTGGGCAGGGAGCCGCTCCACCTCCGCCCTGAGGGGACGGGACTC
TTTCGACCCGAGTGGGAAGGGACATATGCGGACGATGCCAGACCCTGTCTGTGGGGGA
GGGGGAGAAGGCCCTCTTTGGAGAATTCCAGGACGGGTGAGGAACGTGTGCTGGACCGGC
CGGGTCTGGAGGTGGGCCTT

Contig 2 (9234 bp)

GGCAACCAGGGGAAGATGGGGGAAGCGGGGTGCAGGGGCGTTTGCGCGGGCCAAGGACCAC
CTTGAAATCTGGAGCCTGGCAGGAGCGGCGCAGGGTTGAGGGGCTGGCTTGGGCAGGGC
TGGCTGGCACCTGGGAGCCCTGGCGGGGTGAGGTCCGGGCTCCCAGGTGCCCTATAGGCA
GGGCAACATCGGCATGGGGGGTGACAGGCCCGAGCTGGGGTGGCGAGGGAAGAGGGGGA
GCCAGGCATTCATCCCGGTCAATTTTGGTTTTCAGGTCGTGGCGGCTGGTGGTCAGGGGGA
GTTGGAGAGAGGTTGCCCCCGGGGCCCTGGGGCAGCGGAGGTGTAGCTGGCAGCTGTGGGC
AGGTGAGGACAGCCGTCTGCCGGGGCAGGTGAGTCCCTTCCCTCCCCAGGCCTTGTTC
TCTGGCCTCCTGCATCCGGAGGTTCTGGGGAGCGAGGGCCGGCGAGGCGAAGCGCTGAC
CCCCCGGCAGAGTGGCGGGCGGACGACAGGCAAGGCGGGCAGAACAGGTGACACGTCTCAG
GGGAGCTTGGGACCGGGCGGGGCTGGGGGGCGGGGGCGTCCCAGGTGGAAGAGCATCT
CAAGCGAGTCTGGTGGGAGACGAGGCAGGGCTGCCAGCAGGGAGGAGACGCAACAGGCGG
GGGGCATTCAGGCCCGGGTCCGACAGGACCCGTGCGGGGTGTGAGGACAGTGGGGTCCC
CAGCCGCCACTTCACCCACTGCAATTCAATTTAGTAGCAGGTACAGGAGCGGCTCTGGCCG
GGCCTCTTGAGGCCTGAGCTGGAGCCTCGAGGGCCGGAGAATGGGAAAGAAGGTGCAGTG
TGCCAGACAGACGTCACCTGGAGGGAGCACGGCCGTGGGGACGGGCCCCAGAGAGATTC
GGCAGCAGGGAGGCTGCGCGGGCCAGCCTGCGGACGTGCGTTCCACGCAGCACTGCGG
CCCAGGGGCTGGCGGGCAGGGCCCCCGGTGTCTTGGTGGCACTGTGCGCCCTCGCCGC
TCGCCCCCTGGGACTGGCACGGCAGACAGGACAGCACCCAGGGGAGTCAAGGGCACTGACG
AGACCAGACTAGGCGAGGCGGGTGGGGTGGAAATGGATGTGACCTCTGGGGGGAGGGAGGT
GGGGACGCAGGCAGGGGCGAGGCGCCGAGCCTGGCGGCGAGCGAGGCCAAGGCGGGCCT
CTGCGGGTGACAACCTGAGCACATATGGGTACCTTTGCGCTCGCACCGGAGACAGGTGAGT
GTCTGGCCCCGGCCTGCCGCCCTCCCGGCCCGCCACTGCCTCTGCCCTCCCCCTCGACC
AGGGCCCTCTGCTTCCCCACAGCCTCGTCTCCAGTGGGGGTGGACACACTGCCAGCACA
CAGGCCGAGCCAGGATGTGCTTGGAGGGACATGACACAGTCCGGTGTGACGGAGAGGG
ACAGAGCTGACGCCGTCCGGCCTTCTGGTGGAGCGCAGGTCCAGGCCTTGGCCCCCAGGC
CAGCCGCCCCACCCCCACCCCTCATGGCCGTCTTCTGTCCCGCAGAACACTCTCGGCTG
GCCCCGCGGGGGAGCTGCCACACCCAGCGTCTGTTCTTTGCCTTCTTGAAGGAGCACGT
GCATGACTGCTGCTCTCTGGACCCAGAACCTCAAACGACAAGGTGAGGCAGGTCCCGC
CTCGCCCCACAGTGGAAGGGGCGTGGGCGAGAGCCGGCGCTCACGGTGGCCCCCTCCC
CCTGCAGAGATGGTGTCTACCCAGCTCATGCTGGGCCCTTGGACCCGGACTTCTTCAAGTC
CTCCTAGCTCTGACTCAAGAATATGCTGCATTCTGGAGCCACTACACTACTTGACTCAGG

FIGURE 8, CONTD.

[illegible]

FIGURE 8, CONTD.

AAGAGCAACGTCTGAGCTAGCTCCACGCGTGGGTCCATCTCGGCCAGGTTTAAATGAGCC
ACTTTCAGGCAGGGATTGACAGGAGGCAGGGTGGGAAGTGGCTCTGCTCAGACCCCTGA
ACAGGGTCTGGAGATTCTCCAAGGGCACAAAAGAACGGACGATGCCCCTGGGGTACGCGA
CAATGCTCCCTGAGAAATCTTGGCACACAGGGCTGGGCCTGCGAGGTGGCCCCCTCGCCCC
ACCCAGCCTCCTGGAGGACAACCGTCGCCCTGCTCCAGAGCTGGGGGGCGCCACACGT
GGGGCACAGGGAGCATGGGCCCCGATTCCAGGCCTGGGCTCCCTCTCGTGTCCAGGATCTC
CCCGTGTCTTGTCTCAACAAGCCCTGACTTGGAGGGCCCAGGGTGACCCCTTAAAGGGG
GAACAGAAGGTTCTAGAAGGAGCGTGGCCAGCTTTGGCTTCCCTAGGGCTGTGGTGACCA
CACTGGGCCACGGCCAGGCCACCCACCCGCTCCTTCCCCCTGGCCCCCTCCCTTCCC
CGCACCTCTCCCTGGCCTGCACCTGGTGACACGGCTGGCTCCAGCCAGGGCTGAGGGGG
ACCAGCGGGGCCCCCTTCCCTGGAAGCCACCTGCAGGCCGGCTTGTGGGAAGGGGCGCTGC
TCCTCGCCGGCCCCACCCGCCCCGGGGCGTTTCTTGGGAAGCGGTCACTGGATATTTTGT
CCTTGTGAGCGCGAGCTTGACATAAAGCAGACACTGAGCTCCTTGTCTCCGGGAGCACG
CGCTCCATCACCGAACACCTGGCCGGACACAGGCGGGCAGCCGGGCTGGGGGAGCAGCG
CGGGCCTGGGGCCGACAGCAAACGATCACGGCGCCGAGCGAGGGCCCCGCGCCGCTTC
TGCAGGCCGCCCCACGTGCCAGGCCAGCGGTGCCATCCTGCAGGCTGGGAGGAGGC
TGTGGGCGCAGAGCTGAGAAGGGGGCAGAGGCACTGGGGGGGACAGCCGTGTTCACACA
CTTTGACAGAAACCTTGGCCGGCTGGATGTCTTGTGGGAGAGCTGGGGGAGGGGACAGG
GCAGGAAGCCGCTCCCCCGAGCGGGGTAGGAAGAGGCCTCGGCCCTGGGAGGAGGAGGA
GGGGAGGGCAGTGAGATGGAAGAGCACAGGGGCTCGAGGCTTCTTTCTGGAACAAGGA
CTAGAAGGAGGAGGCCGGGCAGCTGCTTGGGATGCTTGGAAACAGGCCGGCCCCAGTGCTG
ACAGGGACGTGACCTGGGGGCGGTCCCGGGCCAGGCGGGCTGGGAGGGCGCCTGGTGG
GTCAGCGCCACTCAGAGCCCTGGCAGCAGGGGGCTGGGCACGGCTGCAGGACAGAGCTC
AGGACACAGATGGGGGCGAGGACTGAGTGGGGCACACAGATGCTCCAGGAGGTGGCCA
AGGAGTGGCCTTGGGATCCAGGATGGCCCTGGTCCCAGAAGATGCGGCAGCCCAAGGGA
CCAGGCCAGGGCCGAGGGGGCCACAATCTGAGCAGGGCTCAGGCCAGGGCAGAGGCC
CCTCCACCCAGCCCTCCCTGGGCCCCGCTCTCC
GTGCAGGCAGTGGGCTCAGATGGGGCAGACATGAGACCAGGTCCAGGGAGAAGCGGGGCC
CCTTGGCTTCATTAGGTGGCTTTTACAGCCGCGCCCCGTGCGTGGCAAGGCCACAGCGC
TCAGGAGCACACAGACCCCCACACGGGCTCCCCAGGTTGGGCGGTGACATCAGCCCTG
TGTC AACAGCAGGAGCTGGCAGCTCCCCACCGGGGCTTAGGGAGCGGGGACCCCTGAGCCA
CCCTGCCACCGCCCCACCCACCGTGGCCACACAGAGGGCCGCTGCTCTGGGTCTGGGG
CCAAGGCCCCCCAGGCGCCTGGCACTGTCTGCCCTCCCGCTGGCTCTCCGTCTCCAGTG
TCCCCGCCAGAGAGCATGGGGCCACAGGCCTGAATGCCACCCTCTTCCCTCCCTCTGGAGG
GGGCTGAGGTTTGGGGGTTACAGAGTGGCCTCCGGGGTGGGTCCAGGCCACGCGAGG
CAAGCGGACCCAGGGAGTCCCGCGGAATGTGGGACAGCCCCCGTAGATCTCGGGGG
GGCCAAGCTCTGGTTGACCTCCATCCTGGGGCTGTGGGCCTTTGGTCAGTGGGGAGGGTC
ATGACACCCAGCCCACAGCTGGTGACAGCCCTGGACGTGCCGGCTCAGGGCTGGCCTGC
CCCTGCAGCCTTGAACCCCTGTTCTCTGGGAGTGGGGGCGCAGGGGGCGCCGGGGCAGGG
TGAGAGACGAGAGCCTCTCTTCCAGAACTTCTGCCTGCGATGAGGACCCAGCAGGGGCC
TCTCCTCACCAGAGGCCCTTGC CGGTG CAGGGCCCCAGAGAGGCCAGAGGCTGGAGG
CCGGGCTTGGGAAGAGGCCGACTTCCAGAAACCAGCTGCCCGCTCCGCAGCACCCAGC
GCCCCTTGGGAGGGGGCGCGCCCCCGTGC CCGCCGGGTCCACTGCTGGGGCCGCCA
CAATAAAGTTTGTCCCTGCTGGTTACTGTCCGTGTCTGAGAGGTTTCTGGAGCCTGGCCA
CAATGGGCGTCAGGATGCGGCTGGGAGGGAGCCTCGCGAGTCAGAGTGTGCTGGTCTCGG
ACAGGCCCGCGCGCCCCAGCCCGTGTCTGTGGACAGATGGGTGGGTGGGTGGGTGTCTG
GAGGGGGTTGGAGAGGGTGGGCGGGACGAGGGGCTTCTGCACTCTGTCCCAGGGAAGCG
GGGACCAAGGAGGGGACAGCCCCGGTCAACAGGAGGGTCTGTCCCTCTCACCCCCCGG
GACAGGTGAGCTCCCCGAGCCGCCCTTCTGGGACAGGACCCACGGCCAGGCCACGGCC
CCCCCACCCCGTGGTCCCTCCGTCCACGGCCGGCCTGGGGGGCCACGGGCCAGGGCC
CCCGCTCCCCGTGGCCCTCCGAGGGTGAACGACCTCGCCTGGGACGTGGGGCAGAGGGC
AGGCGCCAAGAGTGACCCCTGGGACACGTGGCTGTTTGCAGTTCTGGAGGACCGGAGA
TAAAGCGGCTGTTTCCAGTGGGCTCAGGGCCAGAGGGGGCGAGGGGACGCCCAAGT
AAGGCCGGGCGCTGCTCGGGCTCCCTCTGTGCGGAGGGAGGGGGCGGTTGCACAGC
AGCCCTGCCCCGCGCCCCGCGCGGCGCAGGCACCGTGGGACCCGGCCTGGTGGCCCT
CCCCCGCCCCCTGCTCAGGGGCCAGCCCTCTCTGGTTCCAGGACGCCCCCGCCCCGAGG
CGGACAGAGAGTCCCAGAGTGTAGCCTCCCAGTGTGGGATCCTGTATATGCGACAGC
TTAAGTACAGCCGAATTTATGGGTCTGGATTGGGTGGGCACGGGCCCTGCACAGCGG
GGCTGGAAGCCTAAGGCGGTGGGCGTGGGGGTGAGAGGCCCGCAGACAACAGGAGGGAGG
CTGGGACACTTCAAGGGTTGACATGCTATGCCTGTACGGATAAATGC

Contig 3 (5347 bp)

AGATGTGTATAAGAGACAGGGGCTGGGTGGGAAGGACAGAGGGTGGGGCCGGAGGAAATG

FIGURE 8, CONTD.

GGATGCAGAGCCCCACCGTGCACGCTCTGCTGGCCTTTGAGCCTCGCTGAGTCGCAAGAAG
CCCTCGGGCCTGGAAACAGACCCCCGGCCCCACCCCCACCCCGGCCCGGATTACCCC
GGCATGGCTGGAGGGCCCGAGAAGCCACCCAGGCTTCCCGTGCCGAGCTGGGTGCTGGGC
CCAGCCGAGCGGGCTTGACGCCACGCTTAGCCCTCCCCAGGGAGCCCAGGGTCGGAAGGA
AGAGGCCGGCCGGAGGGCCGTGGCCGCTCAGGCTGGAGGGGGCCCCGGGTGCGGATGGG
CCCCAGACGTCCCCGCTCCCCGGCCATCCGTACGGAGCTGTACCCAGGAACGTGCTCC
AGACGTGCTTTCCTGCCGCCGAGGCCCCGAGCAGGCTCCAGGCGCCCCACCCCCGAACG
CCCACGCACACCTCGGTCTGCGAACACCTGCCGTATCCGGTGCCCCCGGTTCCCGCC
GCCCGCGCCATCCGGGTGCCCTTCCCTCCCTGGGTGCGGGGCCATGCCCTCAGCGGGCAC
GCAGGCCTGTGCAGGTCTGTTCTGACTCTTCCCCAAGACGCAGGCGGGCTGCGGGCGCC
CCGACCTCGTCTGAGGCCCGTTGTGCTCAGTGGCTGTCTCAGAAAGGGGTGCCACGGG
AAGCGCGTGTTCCTTGGGCCGCAAGGCAAGGAGCCCCACCCCAAGGTGGCTGAGGGCAA
TGGCCCAGGGCCTCTAAGGAGTCCCTGGGGGCCGGGCCGGCTGCAGCTTGAGGAGGAGA
GCCCTGGCTCTGCTCCCCGGGCAGGTGAGCCACGGCAGGGGGCTCCCCAGCAGCCTTG
GCAGGAAGCAGTGAGGAAGGGGTGAGGATGAAGGCAAGGGGGCCTGCGGGGACTTGGGCA
AAGCCCCCTGAAGAACTGAGTTCCCTCGGAAAGGCCGGAGCCCTCAGCCGAGCCTCGGCCT
CGAGCGATGGAGGCGGCCACCTGCGGCCCGAGGGTGACGCTGTGCATCCGTCCCCCTCG
GGCTCCCCCTGCCCGCCGGCCACCACTCTCCCCCTTTTGCTTTTGATCACTTGAGT
GCGACAGCTTGTGCGGCCGTGAGCCCCAGAGACCGCTGCCCCCTGCCGCCAGCCCCACGG
GAGCGTCCACCTGGGCCTGGCCTGGGCACTCATCCCTCCCGGATGAGGCCTTTCTAGCCT
GGGCCGCCCGGGAGCGGCAGACCCAGCCCCCTCGCCCCCTCCCCCAGTGAAGGTGCTGC
CTGGTGGTCTGGGGAAGCCCCCTGGAACAGGGGGCGCAGGTCCCACACGGGTGCTCTGGCC
TCCAGCTGCCAGGGAGGGCGCGCTCAGGCCAGGGTCCCTCCACCAGAACCGCCAGGGC
CCTGGGGAAAACCTGTCTGTGCTAACAGGGCCGCTCCCCGGGACTCCACGGAGAGGTGCG
AGGGACCCCTGAGCACCCACCGCCACTAAGGGGCCAGCCAGCTCGCGGGTGACGGCAGC
CGGCTGGGCGCTCACATGCATACTGCTCTCTGGCTTTGTGTGTGCGCCTGGGTGGGGTG
AGCGGAGGTGCCCGAAGGCGGAAGAGCCACCCCTCCACTCGGGGACCTATTTAGCAAGA
AGACGGATGGGACTGCCGGGCATGGACAAAGGAACAGGATGAACCTTCTGGAACGCACAA
GGCTTCCACGGCTGACCGGTATAGGAAGGCGCGTCTTAGGCCAATCCACCGTCCACCG
TCCATTCCCCAGCCCTCGAGAGGGGGCAGGATGGACCGCTGCAGCGTGAGAGAGCTCTGG
GGCGTCCCCACAGGGCAAAGTCCCAGGGCACTGACCTCAGAGCCCAACCAGGGCCACCGGG
GCTGGGGCCACCAGGGAGCCGGGGCCAGGGTCAAGGTCAAGGGCCAGAGTGCGGGAAAGG
GTGGCGTGTGCTTGGGGCGGGCGGGCGCAGACGGCCCCCTCGCACCCCCGACAGCCCT
GGAGCTGAGTGAAGCCCGCGGGTACCTTGGCTGGGGTTGGGGTCTCCTGCGACCGGCAC
CCAGCTCAGGTATCCTTGTGTACCGCAGAGGGGCAGGGGTCTGAGCAGGGACAGGG
TGGGCCGCGCAGGAAGCCCCCTTCTCTCTGAGGCTGCCCCGGCCCTGGAGCCTCTCTGGG
GCATGCCACCCCTCTCACAGACGCTCCAGGAGCCCCACTTTCTGCTGCGTGGTGAG
GGTGTCTCTACCCGATTCTTGGCCCCTGACGGTTCAGTGAGTCCCTGCTAAGCCTGGGG
TTGGAGCAGGTGCAGGGCATCACCACACAGCAGCAGAGGCTGTGGGGGGCCCTGAGAGGC
GCTCCCAGGTACCTCCTCAGGGGGCTGAGCCCGGGTTGACCCGGGACCTCGCTGCCCC
CAAAGCCGGCGCCCTCCTCCCGCCCCGCCAGCAGGGCCAGAGAAGCAGGTGTGGGGCGG
CACAAACCCAAGTCAGCTTCCAGATCCTGCTGGGGCCGCGTTGAAACTCGAAGCCCCCAG
GCTGGGAGGTCTAGACACCCCTGCCAGACCGACAGCCTGGGCCTGGCTCACAGCTGCCT
GGGGGCCCAGGGGTGCACCTGCCCTGTGGGTGGGGGTGAGAGGGCAGGGAACCCCTCGGGA
AGGTCCCCCAGGGTCAAGGTGGGGCTAAGCTCCGGTGACCTCTGGGAAGTCTGGGGCTG
GGTTTTGTTCCAGAGGAGAGAGGGCCAGTAGCCTCAGAGGGGCTGTGGCACGGTGGGAA
GGCCCCAGGTGACCCACAGAGCGTGCGAAGCAAGCCCCCTTGACTGCAAAGC
GCAAAGGGCAGAGGTGGGGTGGGAGCCTCGACCCCCGAGCCAGGTACACAGGGGGGAAG
GGCGAGGGATCCGGCAGGGGGCCACACCCGCCACCCAGGCAGCCACAAAGCCTTTGGGC
CCGGAGCCCCAGATGGGCCCAGCCAGCTCTGGGAACAGTCTTCCAGAAATCCCCAGCT
CTGGGTACCAACAGGGCTGCCCGGGCCCCAGAGCCCTCGGGCGGGAGACCTTCCCCAGG
GGGATCTCCTAAGTGGCAAGGCCTGTTGGGAGGGGCTGGTGAGAGGCCACTCTGGCGGGA
AGACCCCCAGCCACCTGGAGCCCCCTAGCCACTGCCTGCTGCGGCTCCCTAGGGATCCAGG
GCCATCAGAGAAGCTCCAGCGACACTGTTTTATTTTCAAATGACACTTTTAAAGAAAAACA
GCCTCACCCAAATGCTTGGCCCTGAGTCTGGAATGTGCAGACAGACAGCTGCCCTCCCC
AGAGCCTGCACGGCCCTCCGGGTGGGGGAGGAGCAGGGGGCACCCCTGGGACCGGGCCGC
AGGCTGTCAAGGGCACGGAACGTGTCTCTGGGCCCTGTCTCAATTCCCGGTGCCAGTGG
CCCCAATTCCCAGCAGACCCAGAGGGGCCAGCTTGTCTTGGCCTGGCCGTGGTCTCT
GTCACCCAGGCCTGGAGTTCTGGAAGATTCTGCTCCTGCTCCCGTGTGCACATACCACT
CCCCGGGGCAGCCCTGCACTTCTGTTCTGCTGGGCTCCCTGCCTGCATCCGTGAGGCCT
GCAGCCCGCTGATCTTCCAGGTCTCTCCGAGCCCCCGCTCCAGGAAGCCCTCCAGG
AGAGCTCAGGAGGGTCCGGTCCCTGCGCGCAGCTGTGACACCCCTGGGCCCCACCCCGCCG
GCTGCTAGGGTCCAGGTCCCCACAAGCCCTCGGGCAGAGGCTGGGCCGCTGGGTCCCTC
GGAGACAACCTGGCTCCGAGGCCTTGCCCTAGACGGGTTTCCGGGAGCCCGTCCCCAGCGG

FIGURE 8, CONTD.

CACCCACTGAGTTTTGAACACTTGGCGCCACCCCCACACCCAGGCGGTGGCCAGGAGGC
CTCCTGGGCAGCAGACAGTCCGTGAGGTGGCCCTGGGGTGGCTCCTGACCTGGGCGCTGG
CCCAGCCCTGGGCACAGCTTTCCAGATCTTGCCCTGCCGCTTCTCCAGGCTGCCTCGGCC
CCTCCCGCTGGGGTGCCAGCTTTTCTGGAGGATGCCACCCCTTGCCCATGGTCAGG
GAGGGGCTGAGAAACCCACCTCGTGCCTCTGCCCGGCTATGCCAGGGGAACAGGTTTC
CCTCCCGCAGGAGGGGACCGAGTCCCTGACAGCCCACTGCAGAGGGGAGGAGGTGCCTGG
CTCTGCCCCAGCCCCACCAACCCCGTGGCTTCTGTTTTGCGAGCCACAAAGCACTAAA
GGCCGCAGGTCTTGAACATCAAAGACCCGGGAAGTCCATTGTATTGAATTGAGTGATAA
TGAGCCTGAGGCCTGTGGCTTGCCTTTCCACAATTACCGCTGCCCGGAAGGGCTCCGG
AACCACACAGCCCCCAGGGCCCTTGCCCATGTGGGGAGCCAGGCTGGCCTGAAGAAG
CCCCATAAGGTGGACCCCACTTTGAGCCCCACGAGAGTGGGCCAAGGACCAGGTACAGG
GCTGCCAGGCTCTGGGCTCCTCTGCCTGCCAGGTGGGCTCCCTCGGGGCCAGCCTGG
CCTGCAGGACCTTCCACGCTGAGTTCCCCAGCCTGGTATGAGCGTAGTGGACGGCAGCC
ATGCCCAGCACTCAGGGGCTGAGGGACAGAGCGGGAACCTCCAGCCCCGGGTCTCGGC
CCCTAGGTCTTTCTAGGTGGGGAAGCCCAAGGGAGCAGAGGGGTGAACGCAGCTGTGTG
GGGCCCCAGGCTGCCGAGCAGACCCCTCCTGCTCCACTCCTCGGCCGAGTGGGCGCCGAG
ATGCCGGGGCAGTGCCATTTCCAGGCGCCACCGGAGGCTCCAGAGGGAGTGAGGCACG
AGCTGGGAGGGAGGGCGGGGGGGCTGGGGAGGCAGAGAGCGGAGGCCGAGGCCGGTGAG
GAGGCCCGGAGGGGGCTGGAGTCAATGACCCAGGGATTATCGTGCTGGGTCTTTGCAA
GTTGGCTGAGCAAACGCCGGAGCCAAGGGTCAGGGAGACGGGACTGGCGGGGGGGCGGG
CCCCCTTTCCCTTTCTGGAAAAAGCCTGTTTCCAGGTCAAATCCAGCTCATGATCCG
CCCCCTTTGGGACTGATGTTTCAAGGGCCAGTGGTCCCAGCACCTCTGTCCACCGCCCC
CCCACGCTCCCGGGGCGGCCAACCCCTGTGGGCTGCGAGGTGCGGGCACCTCTCCCTTCG
AAGCAAAGCCCTGCCCTGCGTGGGCAGCGTGATTTCTGCTTCTCTGGGGCTGCACCTTG
ACTGGGGTGGGGGGGTGG

Contig 4 (1592 bp)

AGCCCCCTCAGCCCCCTCCGAGCAGCTGCTGGGCTCAGCGGGCTCGCCCCCGATGTGCGGC
CCTCCATAATCAATCATGGAGGGCGGGGGGGGGGGGGGGGGGGGCGGGCCGACCTGTCAGCCAGC
TCCAAGGGCAGGGACAGCTGCTGTTCCGGAGGGTTCCAGGGGCCAGCCCCACCAGACAG
CGGCCCTCGGCCCCCTTCCCCGAGGGGCACCCCCACGGAGGGGCCAGACCGGAGGGACTC
GGGGCCCAGAGGCCAGGGCAAGAGTGAAGGCAGCGCCGTGGGAGCGGCGGTACGCGGG
TCCAGGCTTCACTTCCCAAGGAGCCCCATGCCCTGAGCCCGCACTGAGCCCTGTGACGC
TGTGGGTGCCGCCGAGGCCCGCCACCCCGCCCCCACCAGCCTGGGGTCAAGGAGGGAG
GGGGTGGCTGACGGATGGTAACAGCTGCTCCCCCACCTCGCCGGCGTGGACAGGGCTC
GCTTCTCCTGCCGAGCCCCCGGCTGCCCATCCGTACGCGCCACCCAGGACTGTGCGT
CCAGCCTCCCTCCCTCCTAATCCCCCGCATTTTCCGAATTTCTCGGGCCACTGCTGCTTC
CTCCTCAAATTCCTGGCCCCCTCGCCCCATCCCCGCCATGGGAAAGGGCCGCGATGCCA
GGACACTTGCTCGTCTCGGCCGGGCGGGGGGAGGAGCAGCTGGCTGGGCCCGGCAGCTGT
GAGGTGCGGGGGTGCCAGGGAGAAGGGCCAGATTAGGGGGCGTCATGGGAAAGCTGGGA
GGGAACGCTACCCAGAGCCCTCCTGCCGAGCCTGTGCTGCTCCCTCTCCGCAATTCTG
GCCTCTGAGTGCTCCCTGGAGGGAAGGGACCACTGTGTCTGCGGCTCTGGCTCTGCC
AGGAATGTCCATCTGTCCGGGCGGGTTACCTGGCTCAGAGCGTGGGTACCAGCTCATCC
AGCCCTGACGCCCTGCTCTCGGAACAGTGATGGGCCAGGCGCCCCCGTACACCCCCGCA
GCTGGGCTCCACAGACGGGCGCGGATGGCCACGGAGGTGGGGGGCGGGCCCCAGGGCGAG
GCTCCCTCCTGGAAGGGCTAGAGTGTGGGCTGCGCGGAGAGGGAGGCCGGACGGCCAGGC
CAGGTGCAGCCCGGGCAGGTGCTGGTGGGGGCTGTGACCCACGTGTGCAGCTCAAGGGT
CCAGGAGCCCCAGGGACAGAGCCTCAGGGACAGACCCTCAGAGCCACAGCAGGAAGCCTG
GTGGCAGTAGCTGGCGGGGCGGTGGGGTGTCTCGGCCCTGCAGACAGAGGCAGAGGCAGGC
TCCCTGCTGATGACAGGGGCTTTCTCTGTCCCTGGGGGGCGGAGGGGGCGCCGACCATGG
ACCCCGGGCCTCCTCTCGCACGATTCCAGGCCAGCCTGGTCTCAGGCAGTCCAAGGTTG
CACAATGGTCTCCATCGTCCAGAGTTGCAGAGCCAGCACTCTCCCACTGGACGGCGGGCC
GGGGTGGGCTGCACCGCCGCTCAGGGCTCAGGGCCGCGGGCGGCCAGCCNCCGAGGCC
TTGACCCTGTCTCTTATACACATCTCAACCCTG

Contig 5 (831 bp)

TGAGATGTGTATAAGAGACAGGCCTTGACCCTGGGCCTGGCTCAGCTGCGCGCCCTCTC
CTTGACAGCTCCGCCTCGACCCCATCCATCAGCCATTTTCTTACCCTTCTGTAAATAAAAA
ACCCGAAGCGGCGTGGCCCCGTGTCCGCTGGGGTGAAGTGGCGCTGCCTGCTGGTGGCTC
CCACCTGGGCGCGGGCCCTGAAACACACACCCGGCGATGGCTTGGCGGGGGCCCTGGT
GGAGGGGCGGGGGGCGCTCGCTGCCTTGTCTGAAATTTTCGGTCCCACATGCCCGGAC
TCCTCTCCCGGGCCACCTGCAGGCCCCGGCGGTGCCCGGGCACTTTCCCGAAGGACGG

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FIGURE 8, CONTD.

ACTCAGCATTTCCCAGGGCACCTGCTGATGGTGCCAGACCCCGGGGGCCTTCCCGCCGG
GCGCGGGCCCCACGTCGCCCCCTCCAGTGCCACAGCGGGCCTGGGCCAAGGCTGGGAGTTC
TGCACGGGCTGGGGGAGGAAGGCGGGGAGAGGGGACAGTCTCCTGGCGGGGACGAGGG
TGGGGGAGCAGGTGGGGAGTTCCACAGCCGGGGCAGCGGGACGCCGCTTGGCTGCCCT
GGGTCTCAGCCGGGGACAGTGCCACCAGGAGAGAGACGGCAGACAGTACAGCCACCCG
TTTTATATCCTCTCAGCGGCTGTGCTTTATTGGGGTAAATATGCAGGACATAGAACT
CTGCCACTGGACCCCTTGGCCGGGGACACAGCAGCGGCATTGCATGCTTTCTGGGTGCA
GCGCAGCCAGCACCACGGCCAGAGCACCCCATCTTCCCGATCAACCGGAC

Contig 6 (4634 bp)

CTCTGGGCTAGCACCGTGGGGGCTTTGCCAGAGTGGAAGTGAAGTGGGTCCACCCCGGAG
CCCAGAGGGCGGTGAATGGGAGGCAGAGCCCATCCTGGGAATGGACCAGAAGAAAGGGAG
CGGGGGTGGGGGAAGGGGCATCAGATCCTGGTCCCTTCCCTGTGCGCTGCGGTCCCTCTGC
CACCCTCCCCGAAGCTGATCTGGAGCACACGCGTCGTTAAAGCCGCCATCGAGGCCCCA
CTTCTGACAGACGGAAGGGGGCAGAGTGCCTTCCCTACCGGCCTCGCCCTGGGAAGGCCC
CTCCCTGCAGCCAGGAAGCCAGCAGAGGTGACAGAGCCAGGGGGCCAGGGCCCCAGGG
ACGGGCTCGCGCGCCCGAGCCGGGGGTCCCTTGGCGTCCCCATCCTCTCGTCTTGGAGCC
CTCCTGGGTGACCACAGGAATGTGCAAGGCGGCAGCCGGGTGGCGGGCCGGAGGCGGGTG
GGAGGCGGGCGGGGTGGCTCTTACGGGCGGGCCTGAGAGATGGGCGCCCGTCCGGCCC
TGGCGTCATCGTCTCCGCGTCTTACCCACTGAGCAAAGACACAGAAATGAAGCTCGAA
CGAGCACAGCCAAAGAACGGCCGTTTCTGTCTTCTTCTTAATCCCTTTGGCTTAGGGT
TTCCCGGCTGGACAGCCTGCCCAAGGGCACATGGGCATCCGTCCGGGGACATTACAGGCA
GTGACCAATCCAGGCCACCCAGGCTGTGCCCTGCGTCTGGGCCATTTCCAGCCCGGC
AGAGATGGAGCAGCCACTGCGGGTCCCCGAGTCTCGGTGAGACAGTCAAGGATGGACCTT
GGATGGAGACCGGCTGCGGCCATGTCCGTGGGTGAAGGAGGCGTGCAGGCGGTGCTGGG
GGACATGGTTGCTGTCCCTCGGCCAAACCATGAAAAGCAGCCCTCTCCCCAACCCCCA
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GTCCAGCTTGGGACAGGTCACTTCCAGATGTCCAGGCTGGAGCTGGTCTTGAAGATCC
TAGGGGTCCAGCCAGCACAGGAGGGCCAGGTGAGAGCCCCCTGTGGTTCTAAGGATGCA
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ACCCAGGAGGTCCCCAGAGCCAGCTCGGAGGGCCACAGGTGCCAGAGTCCCACCTGG
GGAAGGCTGCCCTTCTGCCAGCCCCGAGCCGGGCCCTGGCGCCCGCTCCAGCCGCG
ACCCCGGGGAGATATTACCCCCCTGCCCCGTGAATCAGGAGGCCCGAGCCCATGTTTT
CAGTCTTTTCTCCCATCCCAGCCCCCAGGAGAAGAGGTGCTGAAGTGGGTCCCCTGG
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GCTGGACAAGTCACTCCTGCCTGCCGCTGATGGGCCCTTGGGAGAAGCAGACATGGTG
AGGAAAGGCCCCCTGTGCCCTTACCCTAATTCCCAAGCCCAAGTCCCAGTGGGTGCC
AGCTTCAACCTAAGCAAATAATTCTGTCCTCTAAACAAACGCGGGGAATCCACCTGC
CCTTCCCCCGCCGCCCCCCC
ACCCCTGGCCTTGACCTCCAAAAGCACTTGAGGGGGCTTTCTCCAGACACCC'TCCAACCC
CGACCCCATGAAGAAGGGGTGATGGGGCTGTTACCCCAACAAGCAAGAGAACGAAGCCCA
GAGAGGAGTTGGCTGGACAGCAGGGGTGAGGCCCTTTGCCCGAGGGCAGGGCTGGTG
CCACCTGGGTGAGGCGGCAGGCCCTGGAAAAGCACCGGAAATGAGCACACCTGGGTCTCT
AGAAGGTTCTTCCAGACCTCTGGGGGTGAGTCAATTTCAACTCTTGGGCCGGGCAGGG
CTTCTTCTTGGCCCCGAGGGACAAGGTCCCTTCTGCGGGGGGTACGGCCCCCTGGACCC
CTGTCCCCCGCACCCACCCCTCCGCTTGGTGAGGGCCGCGGCCAGCTCTGGACACAGATC
CTCAGAGCCCCCTTCTCCCTCCCTGCTCCCTCGTCTTCCCAAGATGCCCGGCCCTCCAGG
TGGGGCAGCCAGGCGGCAGAATGTGGTCCAGGCCCTCTCGGCCCAACCCACACCCCTTGC
TCTGCCCTGACAGCTCCAAGACGCAGGCACGTGCTGCGTTCTGCGTCTGTCTCCTCA
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GACCTGCTCTGCTGTCTTCCCGCCCGGCCCTTACGGGCTCTCCCCAAGGGTGGCCGCG
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TGGTGGTCCGACCTCTTCCCCAAGGCCCGGCCATCCTCCTCGCGCTCCCCCAAACCTTG
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TGCCCGGGGTCTCGCTGACCGCTCTACGGAAGCTGTGCCGGGGGGTGGGGGTGTCTC
TGCCCGAACGGCTGGAGGACGAGCCACATCCAGGGCAGCCGGAACCTGCGTCTTGGTCT
GAGACGGAGAGGCTGGGTGCAGGTGGCTGAGGGGCTGCACACAGCTTGGCTTGGGGTCC
CCTAGGTGACAACACTGGCTGAACACTCATTTGCTGCTCCCTTCCAGGGTGACCTGGGG
TCCCGTGTGGCCCTCAGGGCACACGGGGGCCACAGGCCCTCACAGAACCCCACTGGG
ACTGCACCCAGGGCCACAGAAGTGCGGGGGCACTGGGGGTCCAGAAACAACCCCAAC

FIGURE 8, CONTD.

CAGGCCAAGGTGGCCAAGGCCTTACTCGAGCGGGGCTGCCCGTCCCAAGAGACTCTGGCC
AGTCGTCCGGATCCAGCTTCCCGGGGCGGGGCCCGCTGGGCTCCAGGCGGTCTCTGGG
GGGCCCTCCCCCGGGGTTTCGCCCTCCGCTCTCAGCAGCAGGAAGAGGAGCGCGGCCAGC
GGATGGGGAGAAGAGGGCGCCCTGGCCATCTTGCTCCCCCTGGGACTTGAGGAGGGTCTC
GGGCCGGGCAGGCGGGACCGGGAGCCACAGAGACCCCTGGAGGAGGCAGCATGGCGGGGAG
GTGACCGGGGAAGAGGGCCGTGTCCAGGCTCACAGCCCGGCCTGGCCGCCCGGCCCTCG
GGAGGCGTGCCGCTGACCGCCTGGCCGGGAGGTTTGCTGCGTGTGGGGTTTGCAGAAAGT
GCTGAGCTGCTGAGCCACAGGCCAGGCTCAGAGGGGACAGGAAGGAGGTTGCTGCCAG
CCTCGGGCACTGCTGACCCATCTCCCGTTTCCAGGGCACCAGAGCCACCTAATCTGCCGG
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GAGAGGGTTAAACATCCAGCCCCAGCCAGCATCTCGGGCAGGTTCTGGCTCCCCCGCT
CGTGCCCTCCTCTGAGACCCCTGGTCGGCACACCTTTCCCTTGAGAGGAGGAGGAGGAA
AGCGGATGGAACCAAGTGACCCCTGCAGCCCTGAGGGCACCTTCCACGTGCCCCCGCCCCG
CCCCGCGTCTCCGCCCCAGTTCTCACGGCCCCAGTCTGATGGAGGGAGGGCGACCTC
CGGGCTCCCTGGCTCCCGCCGGCTCCGGAAGACAGGGCCGCTCGGCTGGGGCTGCAGGGA
GGGGCCCGAGACGCAGGAGAGCAGCCCGGAGGCAAACCCCGCGGGTCTTCCAGAAGGAGG
CCTGGCAGGGGGAGGGGGGTGCCACCACTGCTGTCCCTCTCGTGCCACAGTGGAGGGTGT
GGGTGGGCAGTGCCGGGGTGGGAAGTGCAGAAAGACCCTGGACCGTGGGGCTGGGCCGCC
ACGGGGGAGCGGGGTCTGTCAAGGACCCCTGGGGGAGGGAGGCGAAGGGCTGGGGCAGAGG
CCGGATCACTTCCAGATTGCTGTGGGACCAAGGGCCGGACCTCGGGGTGACTTCTTTTG
TGTGCTGGCCACAGGGGGGCCCGGGCGAGGTCACACGGAAGGGGGCTTCGGACCTGGCCT
AACAAGCCCACTCCCGAGGAAGATGCAAGGGGAGGCAGACGGAAGGGCCGAAGGGGGCGA
TCGGGGGACACCGCGGCAGGGCCGGGGCAGAGAAGGGAGGCAGAGGGCAGAGAAGGGAGG
CAGAGGGCAGAGAAGGGAGGCAGAGGGGCCACATGCTTGGAGGGCCAGGGAGGAGCGGGA
ACGGCGTCCGGCGTCCAGCGCCGAATCAGGCCCGTCAGGCGGAGGGTGCGTGACCTGCC
TGGCCTTCACGAGCACAGTCAGCAGGCTGTCTCTTATACACATCTCAACCATCAT

Contig 7 (482 bp)

AGCAATGGGGCCGTGACCTAAGGAGGCAGGCCAGGTCAGTGGGGTGACCTCTCGTGGCC
CCGATGTTTGGAAATCCCCAAATCAAATGACCCATCCGACAAGCTTGATGCCTGCAGG
TCGACTCTAGAGGATCCCCGGGTACCGAGCTCGAATTCGCCCTATAGTGAGTCGTATTAC
AATCACTGGCCGTCGTTTTACAACGTCGTGACTGGGAAAACCCTGGCGTTACCCAACTT
AATCGCCTTGCAACATCCCCCTTTCCGACGCTGGCGTAATAGCGAAGAGGGCCGCACC
GATCGCCCTTCCCAACAGTTGCGCAGCCTGAATGGCGAATGGCGCCTGATGCGGTATTTT
CTCCTTACGCATCTGTGCGGTATTTACACCGCATATGGTGCACTCTCAGTACAATCTGC
TCTGATGCCGCATAGTTAAGCCAGCCCCGACACCCGCCAACACCCGCTGACGCGAACCC
TT

FIGURE 9

Human clone af087017.em_hum1: H19 gene + flanking sequences

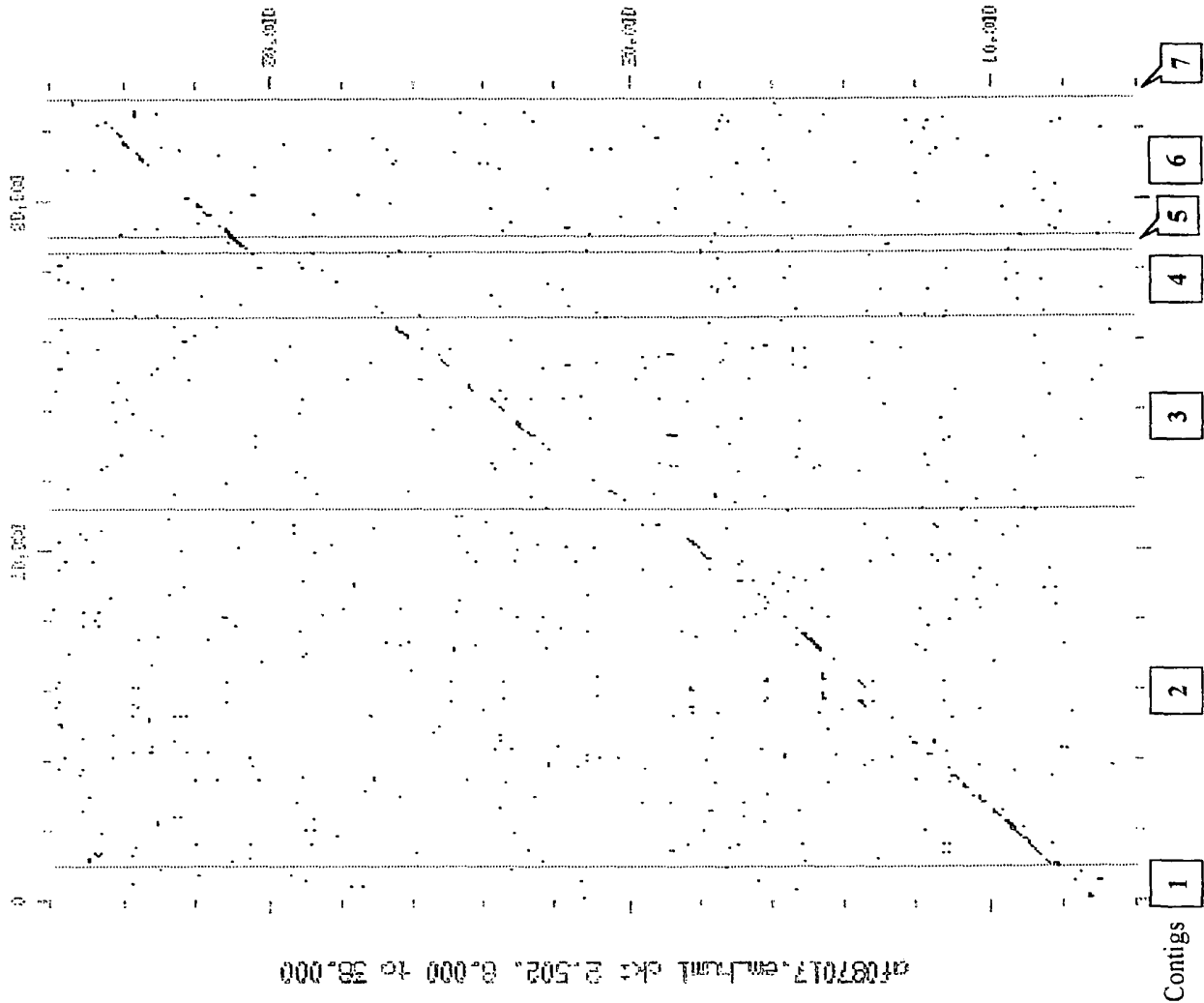


FIGURE 10

IDENTIFIED POLYMORPHISMS:POLYMORPHISMS TYROSINE HYDROXYLASE GENE - CONTIG C3 (figure 6)

1	GGATCCAGCC (A:T) GCAGCC	1081 bp
2	ACAACCCCC (-:C) TCCCACAG	1149 bp
3	TGCGGAGGGG (A:G) GACCTG	1186 bp
4	AGGT (CAAGGCCAGGT: -) CGAGG	1210 bp

POLYMORPHISMS INSULIN-IGF2 - CONTIG C4 (figure 6)

5	CCC (C:A) CCCC (A:C) CGCCGC	438 bp
6	CCC (C:A) CCCC (A:C) CGCCGC	443 bp
7	CGCCGCAGCA (G:A) GCCG	455 bp
8	GCTTATGG (G:A) GCCGGG	503 bp
9	CACGGC (T:C) TC (G:A) GAGCA	525 bp
10	CACGGC (T:C) TC (G:A) GAGCA	528 bp
11	GTCTGC (A:G) GGCAGGTG	571 bp
12	CAAGCCCGG (G:T) CGGTT	636 bp
13	ACCTC (A:G) AGGCCCCCA	710 bp
14	GC (C:T) GGGCCCAGCCGC	867 bp
15	ACCAGCTG (C:T) GTTCCC	903 bp
16	GGC (C:G) CTCTGGGCGCC	1148 bp
17	GGGGG (C:T) GTCCCGGGA	1305 bp

FIGURE 10, CONTD.

18	GCGGT (C:T) GGGGGAGTT	1320 bp
19	CGCCC (C:T) GGTCCCGCT	1400 bp
20	TCCC (G:A) TCTGCCGGCC	1519 bp
21	GA (T:A) GCCCCATCCCCC	1547 bp
22	GG (C:T) GGCTGCTGCGGC	1607 bp
23	TGGCTGC (G:A) GTCTGGG	2222 bp

POLYMORPHISMES IN CODING REGION - CONTIG C10 (figure 6)

24	GCGCA (G:T) TGATTGGCA	341 bp
25	CGCCCCCCCCC (-:C) (G:C) GG	2247 bp
26	CGCCCCCCCCC (-:C) (G:C) GG	2248 bp
27	GCAGCCGGCTC (C:T) TGG	2257 bp
28	GTTGTTG (C:T) TCTGGGA	2413 bp

MICROSATELLITES

29	PIGQTL1: (AT) ¹¹	112 to 133 bp Contig 57
30	PIGQTL2: (GT) ⁸ GCACGCGTGTGCGTGTGTAC (GT) ¹⁷	1074 to 1144 bp Contig 95
31	PIGQTL3: (CA) ¹⁹	223 to 260 bp Contig 105

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/EP99/10209 (22) International Filing Date: 16 December 1999 (16.12.99) (30) Priority Data: 98204291.3 16 December 1998 (16.12.98) EP (71) Applicants (for all designated States except US): UNIVERSITY OF LIEGE [BE/BE]; 20 Bd de Colonster, B-4000 Liege (BE). MELICA HB [SE/SE]; Andersson, Leif, Bergagatan 30, S-752 39 Uppsala (SE). SEGHERSGENTEC N.V. [BE/BE]; Kapelbaan 15, B-9255 Buggenhout (BE). (72) Inventors; and (75) Inventors/Applicants (for US only): ANDERSSON, Leif [SE/SE]; Bergagatan 30, S-752 39 Uppsala (SE). GEORGES, Michel [BE/BE]; Rue Vieux Tige 24, B-3161 Villers-aux-Tours (BE). SPINCEMAILLE, Geert [BE/BE]; Sint Denijsstraat 26, B-8550 Zwevegem (BE). (74) Agent: OTTEVANGERS, S., U.; Vereenigde, Nieuwe Parklaan 97, NL-2587 BN The Hague (NL).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> (88) Date of publication of the international search report: 26 October 2000 (26.10.00)
(54) Title: SELECTING ANIMALS FOR PARENTALLY IMPRINTED TRAITS (57) Abstract The invention relates to methods to select breeding animals or animals destined for slaughter for having desired genotypic or potential phenotypic properties, in particular related to muscle mass and/or fat deposition. The invention provides a method for selecting a pig for having desired genotypic or potential phenotypic properties comprising testing a sample from said pig for the presence of a quantitative trait locus (QTL) located at a <i>Sus scrofa</i> chromosome 2 mapping at position 2p1.7.		

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/10209

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12Q1/68 C07K14/65 A01K67/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C12Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ANDERSSON-EKLUND ET AL.: "MAPPING QUANTITATIVE LOCI FOR CARCASS AND MEAT QUALITY TRAITS IN A WILD BOAR x LARGE WHITE INTERCROSS" J. ANIM. SCI., vol. 76, 1998, pages 694-700, XP002104406 cited in the application	1-3, 10-12
Y	See page 696, "Carcass Composition" and page 698, Fig. 1b. the whole document --- -/--	4-9, 13-27



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Date of mailing of the international search report

08/08/2000

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/10209

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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